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HOW TO USE THIS

■ In spite of the size of this *Encyclopedia Issue,* finding needed information is easy once the system is understood. The issue is divided into five editorial divisions and one directory division as follows:

1. **Package Planning, Methods and Materials.**
2. **Packages.**
3. **Machinery.**
4. **Merchandising Considerations.**
5. **Shipping and Protective Packaging.**
6. **Buyers' Directory.**

The five editorial divisions include more than 100 articles, special charts, tables and diagrammatic presentations; and these for convenient classification are grouped into 17 separate sections. Each section covers a major phase of packaging, such as package development, metal containers, machinery for the packaging line and the like. The directory division consists of three sections: Manufacturers' Literature, Sources for Supplies, Equipment, Services (with alphabetical listing of suppliers with addresses) and Index of Advertisers.

The major reference aids provided in this issue are:

Table of Contents, pages 4, 5 and 6, including a separate list of tables and charts.

An *Index,* pages 7-11, listing and cross-referencing all subjects covered editorially.

The Manufacturers' Literature table of contents, page 713.

The *Buyers' Directory table of contents,* page 727.

Advertisers' Index, page 848.

Solving a typical problem: If you are seeking information on a broad subject such as the selection of a packaging material for a bag or overwrap, turn to the *Table of Contents,* page 4. Note that *Division One* deals with planning and materials. In this division see *Section 4, Films, Foils* and *Laminations.* Separate articles and charts in the section discuss plastic films, cellophane, foil and laminations. When you turn to any article covering a topic you wish to study, you will find that cross references in the article will help you locate related information such as charts or diagrams.

Day-by-day assistance. Many times specific information will be needed for a particular subject, such as the comparing of cellophane, polyethylene and paper costs or properties. For information of this type, turn to the *Index,* starting on page 7, and look for information under headings such as Cost, Films, Cellophane, Polyethylene, Properties, Printing. It is best to look under as many related headings as may occur to you, for in that way you can be sure of obtaining maximum benefit from the *Encyclopedia.* In doing this you

BOOK

will find that much more information is packed into the *Encyclopedia* than can be realized from casual use.

Note that each Section listed in the Table of Contents has its own *Advertisement Index*. Much important information appears in advertisements. Thus, if you are looking for news about wrapping machines that handle films, turn to the *Advertisement Index* for Section 12, pages 413 and 414, and consult the listings for wrapping machinery. These advertisements are related exclusively to the subject covered in the Section. They have been grouped to save your time and make your use of the information more efficient.

Finding sources of supply. *The Buyers' Directory* (the big yellow section in the back) lists some 5,000 different sources of supplies, services and equipment used by packagers. Here you'll find the name of the product you seek together with the page number on which suppliers of that item are listed. For complete addresses of suppliers, always see the *Alphabetical List of Companies*, starting on page 808. Addresses appear only in this section.

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Bold numbers indicate principal reference.

SECTION 1

STRATEGY OF PROGRESS

Packaging's ways to profits

A challenging uphill road confronts packagers in 1962—challenging because producers and marketers of goods must look to packaging to: (1) hold costs in check where possible and (2) provide many of the new ways to merchandise products at a profit. Over-all it appears the outlook is one of upturn. The general economic dip and slide that braked and almost stalled packaging's record-making progress has ended. There is surge again in most of the pipelines of supply. Also, there is the prospect of some further stimulation as a result of both defense and domestic measures being taken by Government. In relation to this, the piper of inflation will undoubtedly have to be paid some more by dancers to his merry tune. Finally, there are the uncertainties of the international situation that defy precalculation.

Closer at hand for the packager are the problems of shifting, rising costs; changes in markets; the sharpening of packaging "tools" as the result of sociological, psychological and economic forces; the increasing permeation of Government influence into packaging affairs, as in F&DA requirements, the so-called deceptive packaging question and the new hazardous-products labeling law. Then there is the continuing boom in packaging materials and in packaging developments and applications.

The cost picture. In business as a whole, the cost-price squeeze has been recognized as a major headache, especially during recent years. Packaging has offered some relief, because packaging costs have not risen as precipitously as costs for other major materials. Today there are important shifts and counter shifts. Plastics in general are lowering costs. Polyethylene film costs were reduced about five cents a pound in 1960. In 1961 there were reductions in the prices for high-density bottle resins, but high-density polyethylene was already contributing to bottle-packaging economy, for thinner-walled containers could be produced. The result has been a sensational growth in the use of polyethylene bottles.

The price of regular polypropylene film was lowered from 70 cents to 64 cents a pound in 1961 and thinner

BASIC DETERMINANTS OF **PA**

THESE BASIC FORCES → / WILL LEAD TO THESE PACKAGING DEVELOPMENTS ↓			SOCIOLOGICAL				
			Younger Families	Larger Families	More Women in Labor Force	Less Frequent Shopping	More Single People
CONCEPTUAL	Convenience Packages	Convenient to Consumer	★	★	★		★
		Convenient to Retailer			★	★	
	Premium (High Quality) Packages				★		
	Product Combination		★			★	★
	Size of Unit Purchases	"Economy"		★		★	
		Individual Portion	★		★		★
		Multipacks	★	★		★	★
	Informational (Self-Selling) Packages		★		★	★	
	Re-usable (Extrinsic Value) Containers			★			
PHYSICAL	Functional Utility		★	★	★		★
	Distinctive Styling		★			★	
	Light Weight					★	
	Strength						
	Standardized Components						
	Improved Reclosure		★	★		★	
	Gift-Wrapped Prepacks			★	★		
	Simplification			★	★		★
	Pressure Dispensing		★	★	★		★

gauges were recommended. Prospects are that oriented polypropylene may encourage even further interest in thin gauges. However, the introductory price of about $1.15 a pound for one mil and up to $1.65 for half mil makes it difficult to say now what oriented polypropylene's eventual economy will be. The introduction of higher-yield cellophanes was a major item of news in 1961 and certainly announced to packagers as a whole that cellophanes are in the battle to the finish for packaging jobs. As one observer remarked, a cellophane producer dropped one shoe and he probably has "shoes on 18 feet." (For example, as this was written cost of polymer-coated cellophane bread wrap film dropped 5¢ to 74¢ a lb.) Cellophane, the largest volume transparent film, set a new record in 1960. Some measure of the continuing promise it holds can be assessed from a study of new cellophanes listed on page 136.

Meanwhile, costs of paper and paperboard were being boosted from 6 to 14%. The increases for some of the papers restored cuts made during the economic dip. Otherwise materials and container costs seemed to be stable during 1961 (see also p. 24) with one authority predicting that container supplies would be plentiful and costs, in general, steady to gradual rising during 1962. Costs of various resins (see table p. 16) were holding steady, but high-density polyethylene for bottles was reduced three cents a pound in 1961 and the cost of acetal resin was lowered from 80 cents a pound to 65 cents.

The costs for paper, films and foils are compared in the table on p. 17. These in relation to performance characteristics are an all-important index for establishing the parameter of materials selection.

An asterisk for improved or superior packaging could be awarded a majority of the products that experienced a major sales hike during 1961. And a study of the packaging improvements would unquestionably indicate that convenience helped account for more dollar gain than any other packaging factor.

Among the facts of life that most merchandisers must accept is the high tide of emphasis on new products. Most manufacturers expect the bulk of their sales expansion to stem from new products. The head of a major food processing company recently was quoted as saying 40% of his firm's products were not on the market in 1950 and they account for a quarter of the company's present business.

The example is significant. In many companies, today's business comes from products not on the market 10 or 15 years ago. The result is to force continuing major attention on the development of new products. However, the mortality rate is horrendous: reportedly, four out of five products introduced yearly in the grocery field fail in their first year. One report states that development-stage odds are 50 to 1 against the success of any proposed new product. Among the factors that make for such slot-machine odds are the tenacity of established products and the fact that new products tend to be developed faster than the supply of dollars or the customer's capacity to consume more products.

New or improved packages, of course, can serve in two fields: that of the established product and that of the newcomer. For the latter they are almost mandatory. The development of new packages must be a major concern for progressive firms. New packages can speed the marketing program by helping improve the odds for new product success.

Other Goals

The goal of employing packaging strategically to lower costs or hold them in rein stems not alone from the downward trend in certain material prices and price stability in general. Tremendous gains are being made in the use of lighter-weight materials that are stronger and more functional, and thus the way is opened to package simplification. A major source of such benefits is in the marriage of plastics to paper, paperboard, foils, metals and glass so that two materials or structures can do the job that formerly called for three or more.

To paraphrase one authority in this area: high-cost plastics are being

OF PACKAGING DEVELOPMENTS

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	PSYCHOLOGICAL				ECONOMIC					
More Single People	Desire for Something New	More Discriminating Consumers	Higher Value on Leisure	Avoidance of "Messiness"	Rising Labor Costs	High Transportation Costs	More Self-Service	Larger, Diversified Retailers	More Vending Machine Selling	More Disposable Income
★	★		★	★						★
	★		★		★		★	★		
	★	★						★		★
★	★		★	★	★		★		★	
★	★	★		★					★	★
★					★		★			★
	★	★			★		★	★	★	
★		★	★				★			
	★	★					★	★	★	★
					★	★	★	★		
						★			★	
					★		★		★	
	★		★	★						
	★	★	★		★		★	★		★
★		★	★	★	★		★	★		
★		★	★	★						★





GROWTH DIRECTIONS. High-density polyethylene bottles are helping many products chalk up sales increases. New areas include polishes and bleaches. (*Hercules photo*)

NEW POTENTIALS. Improved aerosol containers, pressure systems and designs will spur success for products like those shown. (*Precision Valve photo*)

used to upgrade relatively low-cost papers and paperboards, so that the latter can compete functionally and at a better cost level with the superior job done by plastics alone.

The Government story

In 1961 various major packaging materials (including cellophane, polyethylene, certain papers and paperboards, glass, cans, closures, etc.) received F&DA clearance and provision was made under certain circumstances for extensions that could continue for some other materials into 1964. One fact has stood out all along: F&DA clearance of packaging materials can be a very complex and costly affair. One materials supplier estimates that a quarter of a million dollars has been spent on a single research project to develop data required for clearance.

Problems of a new and potentially more alarming nature arose in the summer of 1961 with the start of Congressional hearings on so-called deceptive packaging. To anyone with the slightest knowledge of packaging it was apparent that the public was unduly alerted by headlines crying, for example, that a wave of cheating was sweeping the country. Consumers were being egged on into believing that a great deal of "sinning" might be uncovered in packaging. The very serious aspects of this matter have already been recognized ("Deceptive Packaging," a special editorial report, MODERN PACKAGING, August, 1961, p. 107 and reports in subsequent issues).

For years the Encyclopedia Issue of MODERN PACKAGING has carried articles dealing with legal aspects of packaging and related subjects of weighing and labeling. Editorially this publication has always supported this policy: (see p. 32) "The consuming public assumes that the manufacturer, packer or distributor has kept the consumer's health and welfare uppermost in mind and expects a package and/or product to be free from contamination. Mislabeling, deceitful, negligent packaging or adulteration can lead to financial penalties and serious legal consequences. And the resultant loss of consumer good will can cause irreparable damage. It is not impossible to combine mandatory information with good design. Proof of this exists on every shop shelf in the country."

But there is, in fact, something nightmarish about packaging's having to defend itself *in toto* against shotgun-blast accusations. The public has only to consider the improvement packaging has made in sanitary handling of food, the elimination of waste, the many economies that have been afforded, the continuing empha-



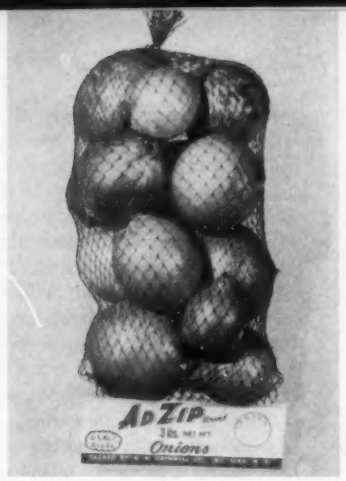
NEW FUNCTION. Oriented polypropylene gives tear-strip advantage. (*Kordite photo*)

Growth of packaging film market

One producer's estimate, millions of pounds

	1958	*1959*	*1960*	*1961*	*1962*	*1963*	*1964*	*1965*
Cellophane	415	436	439	454	465	477	487	495
Polyethylene	183	250	272	330	349	384	394	400
Polypropylene[1]	—	—	2	12	25	45	100	140
Pliofilm	10	11	12	13	14	15	16	17
Vinyl	10	12	15	17	19	21	23	25
Polyvinylidene chloride	14	15	17	19	20	21	23	25
Polyester	1	1	2	3	4	6	8	10
Cellulose acetate	5	5	5	5	5	5	6	6
Total	638	730	764	853	901	974	1057	1118

NOTE: Revised from *Modern Plastics*, Jan., 1961. Coating and household wrap markets not included.
1 Polypropylene estimates include sheet and are for all uses including packaging. They could vary up or down drastically. See also *Modern Plastics*, Aug., 1961, p. 75.



COLORFUL polyethylene netting helps meet "desire for something new," as well as being useful. (*Du Pont photo*)



SALES SUBTLETY. Peekaboo carton reveals gift-wrapped bottle and adds design interest.



FREEZE-DRY PROCESS opens new chapter in convenience. Packaging will play vital role.



CONVENIENCE. Handy one-way bottle enjoyed major success in 1961 —helped by wraparound multipack. (*Reynolds Metals photo*)

SHRINK SLEEVE using 1-mil irradiated polyethylene film provides new functional wrap: tightly positions small box on large one without danger of tears at box corners. Light tack seal at overlap eliminated need for manual end seal. (*Film, Cryovac Div., W. R. Grace & Co.*)



NO CAN OPENER is needed to open this new straight-sided aluminum container made by multiple draw technique. Two cans are sold in folding carton. Product is freeze-dried. (*Can, Central States Can Corp.*)





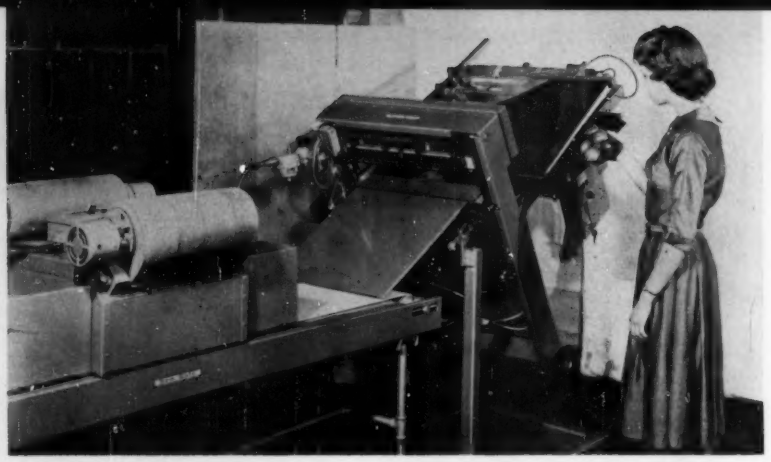
AMBITIOUS job for paper-plastic combination is this oven-going tray that would vie with metal or ceramics. (*Haveg Industries photo*)



MULTIPLE advantages stem from use of "E-flute" board. (*Alton Box Board*)



CHALLENGE in better beer packaging is met by this new easy-opening aluminum top for a beer can. (*Kaiser photo*)



NEW SYSTEM and equipment are designed for film wrapping of tray packs of produce, open-top boxes and loose items so that product arrangement is not disturbed. Unit is teamed with shrink tunnel. (*MA System, Mehl Mfg. Co., photo*)

sis on visibility and effective display to realize that someone is now trying to "crack a peanut with a sledge hammer." An examination of the charges made to date shows that the question is more a probing as to *what is value*—a dangerous area for Government searching. Very few examples of fraudulent or illegal packages have been cited, and no responsible packager will object to their exposure—if evidence warranting investigation does in fact exist. In this connection, the checklist of requirements for the legally acceptable package (page 33) should be *must* reviewing for every packager concerned with this problem and its effects.

One burning aspect of this question is how much more there will be to this *Government Story in Packaging*. The question of just how much safer and more "honest" packages will be after packaging has turned itself inside out to meet all requirements is a good one. The cost in relation to the amount of public good should be assayed to whatever extent possible. And probers or accusers should be asked to spell out for the American public just how non-deceptive a store and its merchandise should be. The warehouse for military supplies and the Quartermaster designations on materiel are very efficient. They are also totally free of any effort to sell or "deceive." But who'd enjoy shopping with military code numbers?

The materials boom

One of the biggest single factors contributing to packaging's growth is the continuing rapid introduction of new materials. In 1961, expanded polypropylene facilities (including AviSun, Eastman, Enjay, Hercules) went on stream. Additional producers made known their plans to enter the field, expand operations and to team up various marketing programs. (See also the series on polypropylene, *Modern Plastics*, in the August and October issues, 1961.) All in all, there was immense activity in the field with a number of new grades of resin being announced, and oriented polypropylene film being readied by a number of producers. It appears certain that 1962 will be the year of answers for some of the polypropylene questions that many are asking.

COST TABLE
Plastics for molded containers, closures, components

Type of material		Base price[1] per lb. $	Specific gravity, molded	Cost per cu. in., cents	Color range	Molding method[5]
Acrylics	Clear	0.530	1.18	2.26		I
	Colors	0.590	1.18	2.51	Unlimited	
High impact	Natural	0.465	1.12	1.88		
	Colors	0.485	1.12	1.96	Good[4]	I
Cellulose acetate	Clear	0.500	1.30	2.34		I
Translucent	Colors	0.460	1.30	2.15	Unlimited	
Opaque	Colors	0.400	1.30	1.88	Unlimited	
Butyrate	Clear	0.620	1.20	2.69		I
	Colors	0.620	1.20	2.69	Unlimited	
Propionate	Clear	0.620	1.21	2.71		I
	Colors	0.620	1.21	2.71	Unlimited	
Acetal	Natural	0.650	1.43	3.36	Unlimited	I
	Colors	0.740	1.43	3.81	Unlimited	I
Ethyl cellulose	Colors	0.720	1.15	2.98	Good[4]	I
Melamine[2]	Colors	0.470	1.50	2.55	Good[4]	C
Phenolics[2]	Brn. or blk.	0.205	1.36	1.01	Limited	C
Polyethylene	Natural	0.275	0.92	0.91		I
	Colors	0.315	0.92	1.05	Good	
High density	Natural	0.320	0.95-96	1.10	Limited	I
	Colors	0.380	0.95-96	1.30	Good	I
Polypropylene	Natural	0.420	0.90	1.36		
	Colors	0.510	0.90	1.66	Good	I
Polystyrene[2]	Clear	0.180	1.05	0.68		I
	Colors	0.220	1.06	0.84	Unlimited	
Modified styrene[3]	Natural	0.275	1.07	1.06		I
	Colors	0.315	1.07	1.21	Good[4]	
Ureas	Colors	0.340	1.50	1.84	Good[4]	C

1 The prices given here are those prevailing at the time this table was prepared. Current prices should be obtained for purposes of actual comparison. 2 General-purpose grades. 3 Also styrene acrylonitrile, $0.395 clear, $0.435 colors and methacrylate styrenes, $0.49 clear. 4 In solid colors. 5 I = Injection molded; C = Compression molded.

Also announced in 1961 were:

1. A *new extruded, unplasticized polyvinyl chloride sheet* for thermoforming (Nixon-Baldwin)

2. *New strand-type foamed polystyrene* cushioning material (illustrated p. 18)

3. New types of *shrinkable film* (Goodyear, Reynolds, Cryovac, others)

4. A new brand of *stretchable paper* (illustrated p. 18)

5. The *high-yield cellophanes*, previously mentioned

6. A *latex formulation of polyvinylidene chloride* (National Starch and and W. R. Grace), reportedly an important new advance toward the single-wall barrier carton (illustrated p. 18)

7. Two new types of polyester film, a more formable, deep-drawing grade and a type specifically designed for use on pouch form-fill machinery (Du Pont)

8. A *nonfogging vinyl film* for produce wrapping (Borden's)

9. Commercial introduction of *fluorohalocarbon* (p. 129) and *nylon* film (Allied Chemical)

10. A new brand of *acetal resin* (Celanese)

11. *"E-flute" corrugated* (Alton Box Board) offering printing, compactness and strength advantages so that shipping boxes can do a dual job in display and merchandising (illustrated p. 18)

12. New on-machine *gloss-coated boards* offering brightness and color range improvement in heavier grade boards (Interstate Folding Box)

13. *New whitening agents* for producing brighter board stock (American Cyanamid)[1]

Still new in potential, although the materials themselves were not new in 1961, are:

1. *Extruded polystyrene foams* for vacuum forming, laminating and cushioning (Applied Research, Dow, Koppers, Sun Chemical)

2. *Polyethylene netting* (Du Pont)

3. *Shrink-type* and *antifog polystyrene film* (Visking)

4. *Lightweight tinplate* (Modern Packaging, July, 1961, p. 95)

5. *Lightweight glass* (p. 352 this issue) and *coated glass* (Modern Packaging, Sept., 1961, p. 146)

6. *Water-soluble film*, which one

1 The purpose of this list is to cover some of the high spots of the materials boom in 1961 to show just how extensive it was. The list obviously is incomplete. Additional new materials are described in the regular sections of this issue. Others have been reviewed in the recent issues of Modern Packaging. The reader is referred also to the advertisements index for each section

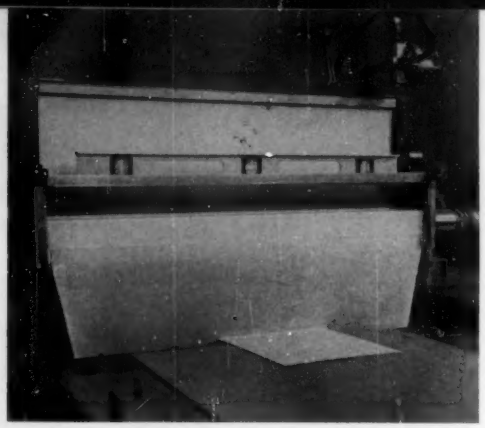
COST TABLES: PAPER • FILMS • FOILS*

Material[1]	Cost per lb.	Yield, sq. in. per lb.	Cost per 1,000 sq. in.[3]
Glassine			
Bleached, 25 lb.[2]	$0.248	17,280	$0.014
Lacquer-coated, moisture-proof, heat sealing, 28 lb.[2]	0.435	15,428	0.030
Laminated, amber, 47 lb.[2]	0.30	9,191	0.033
Laminated, bleached, 47 lb.[2]	0.31	9,191	0.034
Pouch paper, 25 lb.	0.21	17,280	0.012
Waxed paper			
Bread-wrapper grade, 39 lb.	0.23	11,080	0.021
Liner grade, moistureproof, amber, 29 lb.	0.255	14,890	0.017
Cellophane[4]			
Moistureproof, heat sealing (195 MS)	0.62	19,500	0.032
(210 MS)	0.62	21,000	0.030
(220 MS)	0.62	22,000	0.028
Moistureproof, water resistant (195 MSA or MSB)	0.65	19,500	0.033
Polymer-coated (195)	0.79	19,500	0.041
(250)	0.74	25,000	0.030
Polyethylene-coated	0.79	18,200	0.043
Cellulose acetate			
Cast (1 mil)	0.93	22,000	0.042
Extruded (1 mil)	0.74	22,000	0.034
Cryovac S (60 gauge)	1.17	28,700	0.041
Pliofilm (SS-75)	1.10	33,000	0.033
Polypropylene (1 mil)	0.64	31,000	0.021
Polystyrene, oriented (1 mil)	0.60	26,300	0.023
Polyester film			
(1 mil)	2.25	20,000	0.112
(½ mil)	2.75	40,000	0.069
Polymer-coated (½-mil base)	2.50	27,300	0.092
Polyethylene			
Low density (1 mil)	0.46	30,000	0.015
(1.5 mil)	0.46	20,000	0.023
Irradiated (Cryovac L, 1 mil)	0.90	30,000	0.035
Medium density (1 mil)	0.54	30,000	0.018
High density (1 mil)	0.59	29,000	0.020
Polyethylene-cellophane (1 mil poly-300 MS)	1.05	11,800	0.089
Saran (1 mil)	1.08	16,300	0.066
Vinyl			
Cast (1 mil)	0.83	21,600	0.038
Extruded (1 mil)	0.65	21,500	0.030
Foil-acetate (1 mil Al. foil-1 mil acetate)	1.50	6,490	0.231
Foil label stock (0.00035 Al. foil-30 lb. paper)	0.45	9,240	0.049
Aluminum foil (unmounted)			
Thickness, inches			
0.00035	0.856	29,300	0.029
0.001	0.716	10,250	0.070

* Based on 1961 price lists for volume orders.
1 Typical unprinted commercial packaging grades.
2 Based on a ream of 500 sheets, 24 by 36 in., or 3,000 sq. ft.
3 For performance ratings see various properties charts in this issue.
4 Also see table in cellophane article, Section 4.



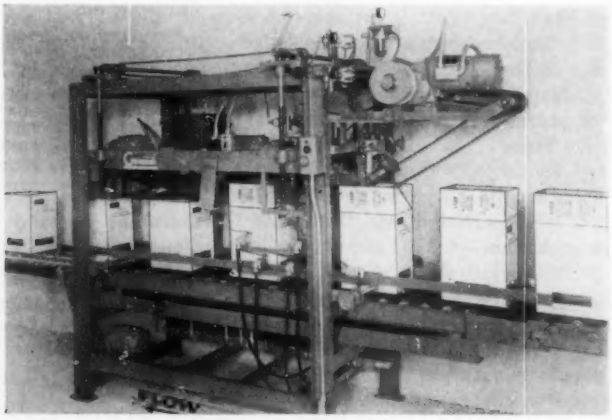
RAYON STRAPPING offers new advantages: handling ease, safety, economy. (*American Viscose photo*)



NEW polyvinylidene-chloride latex, applied by curtain coater, offers improved-barrier and application advantages. (*National Starch photo*)



SEARCH for cost reduction gets boost from new materials such as lightweight plate. (*American Can photo*)



SPACE SAVER. Machine seals cases at speeds up to 50 a minute. Length is only 9 feet. (*General Corrugated photo*)



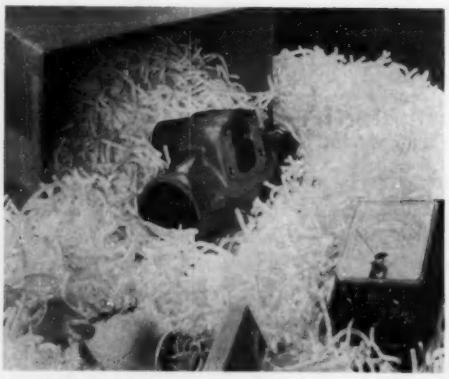
NEW EFFICIENCY. Machine decorates containers to 1-gal. size—usually a more costly operation. (*Dennison photo*)



CONVENIENCE in shipping containers. New polyethylene insert sleeve. Promotes better handling. (*Chase Bag photo*)

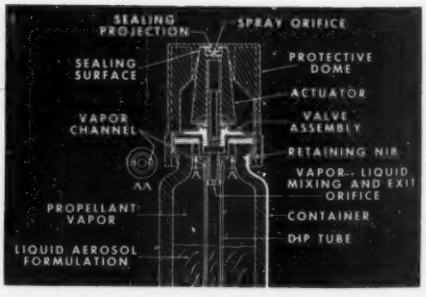


SOURCE for major economies stems from improved shipping containers. This feed bag uses tough extensible paper. (*Photo, Owens-Illinois; paper, Scott Paper Co.*)



SPAGHETTI-LIKE polystyrene foam may lead to important efficiencies and economies for packagers of machinery parts, ceramics, etc. (*Dow photo*)

NEW OPPORTUNITY for pressure packaging is provided products that clog or corrode by non-metallic valve and self-sealing cap. Designed for anti-perspirants, etc. (*Risdon photo*)



producer believes will be reduced to the 80 cent–$1 level (per lb.) within five years, with improved humidity resistance and types acceptable for food packaging on the way.

7. *Polycarbonate film* is another film with new possibilities. One authority regards it as promising for use in gas packaging (p. 252).

New directions

Among the advances that point the way to gains in packaging-merchandising are the following:

1. *Shrink packaging.* This method is apparently on the threshold of making important contributions to packaging-merchandising logistics. Shrink-film packaging adds greatly to neatness and dramatic effect. It is a working material that can grip, immobilize, fasten, group, unitize and perform similar packaging chores. It offers the economy of film gauges in certain areas where heavier, more expensive materials already have scored impressive successes. (See p. 492 this issue and "Shrink: A New Dimension in Films," MODERN PACKAGING, August, 1961, p. 116.)

2. *High-density polyethylene bottles,* on the basis of function, attractiveness and economy, swept through the detergent field. They are now moving into bleaches, polishes and other household products. (See also p. 276, this issue.)

3. *Aerosols.* This field continues one of the most volatile. The piston-type aerosol for Brylcreem was a major advance. It may carry certain personal products, pharmaceuticals and foods into impressive new marketing adventures. Right Guard deodorant was apparently a solid success based on improved aerosol function and attractive design. Starches, shoe polish, liquid bandages and various powder aerosols look like successes of the future. Containers and valves are being improved. A liquegas propellant (C_4F_8) now has F&DA clearance and new opportunities for food and drug aerosols may result.

4. *Food packaging.* This field, as always, was alive with promising new developments including packaging for freeze-dried foods; tear-off-lid aluminum cans for soup; a polystyrene milk bottle; oven-going, plastic-coated paperboard containers for food; formed polyethylene containers for heat-and-serve foods, and a new five-barrier milk carton, employing a new sprayed-on polymer wax interior coating (American Can) plus many advances in unit-of-use, table service and institutional food packages.

5. *Protective packages.* The foams appear to be taking the lead here (see p. 287) but impressive advances also are being made in the use of plastic shipping containers (p. 698). Also, procedures involving containerization and the use of packages that offer function as well as shipping protection are providing new efficiencies. (See pp. 664 and 703.) Improvements in corrugated and in shipping bags were unusually bountiful in 1961 (pp. 670 and 688). By nature of their use through wide segments of the packaging field and in large volume, the improvements in shipping containers involve very large stakes. Some worthwhile dollar savings stem from the use of stretchable paper shipping sacks (see illustration p. 18) or water-resistant corrugated preprinted corrugated, self-sealing shippers, new bulk filling equipment or the use of corrugated boxes that permit tray-tier merchandising.

1962 Calendar of packaging events*

EVENT[1]	DATE	PLACE
American Rack Merchandisers Inst.—AC	Jan. 7-13	Sheraton Towers, Chicago
National Canners Assn.—AC	Jan. 21-24	Americana, Bal Harbour, Fla.
Society of the Plastics Engineers—Technical Conference	Jan. 30-Feb. 2	Penn-Sheraton, Pittsburgh
Technical Assn. of the Pulp & Paper Industry—AM	Feb. 18-22	Hotel Commodore, New York
Nat'l. Flexible Pkg. Assn.—Meetings	Mar. 14-17 Oct. 2-4	Boca Raton, Fla. Waldorf-Astoria, New York
Purdue Univ.—Industrial Pkg. Short Course	Mar. 19-30	Campus, Lafayette, Ind.
Folding Paper Box Assn. of America—AM	Mar. 26-28	Drake Hotel, Chicago
American Management Assn.—Packaging Exposition	Apr. 9-12	New York Coliseum
Flexographic Tech. Assn.—AM, Tech. Forum	May 7, 8	Pick-Congress, Chicago
Nat'l. Fibre Can & Tube Assn.—AM	May 13-15	Grand Hotel, Point Clear, Ala.
Super Market Inst.—AC	May 13-16	McCormick Pl., Chicago
Nat'l. Paper Box Mfgrs. Assn.—AC	May 23-27	Broadmoor, Colorado Springs
American Soc. for Testing Materials—AM	June 24-29	Statler-Hilton, New York
Toilet Goods Assn.—AC	June 24-29	Chateau Frontenac, Quebec
Western Packaging Exposition	July 17-19	Auditorium, San Francisco
Nat'l. Inst. of Packaging, Handling & Logistics Engineers—Meetings	3rd Wed. Sept-May	To be announced
Fibre Box Assn.—AM	Oct. 10-12	Waldorf-Astoria, New York
Packaging Inst.—Packaging Forum	Oct. 15-17	Conrad-Hilton, Chicago
Produce Packaging Assn.—AC & Exposition	Oct. 21-24	Sheraton Hotel, Philadelphia
Packaging Machinery Mfgrs. Inst.—AM	Nov. 12-14	Ponte Vedra Beach Club, Fla.
Nat'l. Paperboard Assn.—AM	Nov. 14, 15	Waldorf-Astoria, New York
Chemical Specialties Mfgrs. Assn.—AM	Dec. 3-5	Mayflower, Washington, D.C.

*Based on replies to a questionnaire. This list is not represented as complete. Also, details were obtained far in advance and may be subject to change. Reader is advised to consult sponsor for up-to-date details. 1 National events. AC denotes annual convention; AM, annual meeting.

1962 Packaging competitions and awards*

TITLE	ENTRY DATES	AWARD DATE[1]	SPONSOR
Aerosol Package Contest	July 1-Oct. 15	At Dec. meeting	Chemical Specialties Mfgrs. Assn.
Fibre Box Competition	Through Mar. 1	May 3	Fibre Box Assn.
Flexible Packaging Competition	Through June 1	Spring, 1963	Nat'l. Flexible Pkg. Assn.
Flexographic Printing Competition	Through 1961	May 7, 8	Flexographic Tech. Assn.
Folding Carton Competition	Through Dec. 31, 1961	At spring meeting	Folding Paper Box Assn. of America
Outstanding Contribution to Govt.-Industry Pkg.	Through 1961	May 16	Nat'l. Inst. of Pkg., Handling & Logistics Engineers
P. I. Corporate Award P. I. Professional Award	Through June 1	October	Packaging Institute
Set-up Box Competition	Through Feb. 1	At spring convention	National Paper Box Mfgrs. Assn.
Variety Store Packaging Contest	Through summer	Fall award	Variety Store Merchandiser

*Based on replies to a questionnaire. This list is not represented as complete. Also, details were obtained far in advance and may be subject to change. Reader is advised to consult sponsor for up-to-date details. 1 See Calendar of Events, above.

Packaging's growing markets

by O. C. Reynolds*

The packaging sector of the U. S. economy has experienced a tremendous growth during the past 20 years, accelerating faster than the total of all manufacturing activities. This growth can be measured readily by three factors: above-average gain in value of shipments of containers and packaging materials; expanding employment, particularly since 1947; and increased productivity of production workers.

Shipments. From 1939 to 1958 the value of shipments of containers and packaging materials increased almost 500% in current dollars, as compared with 385% in the Gross National Product and 413% in total manufacturing sales. Real growth of packaging, as measured in constant 1954 dollars, amounted to 135%, whereas GNP increased 111% and manufacturing sales 123%. Glass containers, paperboard containers, and bags except textile, exceeded the general average of packaging, with paper and plastic bags the percentage leader. In constant dollars, 1958 shipments of textile bags, veneer and plywood containers, and cooperage were below the 1939 dollar volume. (See table at left.)

Employment. The growth of packaging also can be measured by the number of production workers. From 1939 to 1958, the number of production workers increased 40% or at about the same rate as all manufacturing. Employment declined in wooden containers during the 20-year period but picked up in other major container industries. Bags, except textile, led with an increase of 186% in production jobs, with glass containers and paperboard containers a close second. Whereas 1958 production-worker jobs declined from both 1954 and 1947 levels in total manufacturing, increases occurred in the field of packaging; 1958 increased 0.4% over 1954 and 3% over 1947, compared with decreases of 7 and 9%, respectively, for all manufacturing. Again, bag industries, except textile, were the leaders, percentagewise, in employment in 1958 over 1947 and second to sanitary containers in 1954. (See table, top, p. 24.)

Employee output. The average output per worker in packaging has been consistently below the average for total manufacturing. (See the table, left.) This fact results from the high output per employee in the nondurable goods industries, particularly petroleum, tobacco, chemicals and food. Compared with durable goods industries, packaging output per production worker increased an average of 10% for the four years reviewed. The output value per employee in packaging falls within the 10 highest U. S. industry groups. For 1939, textile containers, bags except textile, metal shipping containers and metal cans exceeded the average output per

* Chief, Materials & Services Branch, Containers & Packaging Div., Business & Defense Services Administration, Dept. of Commerce, Washington, D. C.

Real growth of packaging compared with gross national product and manufacturers' sales 1939-1958 (based on 1954 constant dollars)

Industry sector	*Percentage change, 1958 compared with*		
	1954	*1947*	*1939*
Gross national product	+10	+ 41	+111
Manufacturers' sales	+ 1	+ 24	+123
Packaging, average	+13	+ 38	+135
Textile bags	−27	− 57	− 27
Wooden containers	−24	− 34	+ 19
Veneer and plywood containers	−17	− 26	− 19
Cooperage	+ 3	− 51	− 20
Bags, other than textile	+28	+113	+360
Paperboard containers	+12	+ 39	+211
Sanitary food containers	+35	n.a.	n.a.
Fibre cans, tubes, drums, etc.	+ 2	+ 68	+116
Glass containers	+21	+ 53	+137
Metal cans	+19	+101	+121
Metal barrels, drums, pails	− 3	+ 5	+114
Collapsible tubes	+ 6	+ 24	+105

n.a. = Not available

Average output values of production workers in packaging compared with total manufacturing, 1939-1958 (in constant 1954 dollars)

Industry sector	*1958*	*1954*	*1947*	*1939*
All manufacturing industries, average	$24,388	$22,429	$17,986	$15,565
Durable goods	20,629	18,770	13,808	12,577
Nondurable goods	29,139	27,293	23,048	18,240
Packaging, average	22,561	20,031	16,561	13,282
Textile bags	24,431	25,691	35,361	21,100
Wooden containers, average	11,034	10,620	9,705	5,788
Nailed wooden boxes and shook	11,556	n.a.	n.a.	n.a.
Wirebound boxes and crates	9,906	n.a.	n.a.	n.a.
Veneer and plywood containers	5,406	5,223	4,196	3,719
Cooperage	18,427	18,119	14,886	11,058
Bags, except textile	25,917	23,021	19,740	16,094
Paperboard containers, average	22,344	20,498	18,395	12,723
Folding paper boxes	21,437	n.a.	n.a.	n.a.
Set-up paper boxes	9,931	n.a.	n.a.	n.a.
Corrugated shipping containers	27,602	n.a.	n.a.	n.a.
Sanitary food containers	26,227	23,344	n.a.	n.a.
Fibre cans, tubes, drums, etc.	16,175	14,034	10,934	10,445
Glass containers	16,013	14,452	12,140	12,778
Metal cans	35,118	28,774	20,059	25,480
Metal barrels, drums, pails	30,270	25,892	22,349	16,834
Fluid-milk shipping containers	16,602	n.a.	n.a.	n.a.
Collapsible tubes	11,992	9,872	9,360	10,187

n.a. = Not available

Value of packaging materials: 1939–1960*

Container or material	*1939*	*1947*	*1959*	*1960*
Paper and Paperboard Containers (total)	**$551,542,000**	**$2,064,079,000**	**$4,684,291,000**	**$4,704,111,000**
Grocery, variety and specialty bags		184,265,000	567,400,000	613,000,000
Paper shipping sacks		153,209,000	337,424,000	328,000,000
Folding paper boxes and cartons	126,873,000	400,755,000	850,720,000	850,000,000
Set-up paper boxes	101,541,000	255,926,000	307,939,000	310,110,000
Sanitary food containers (liquid-tight)	29,056,000	137,374,000	643,000,000	645,600,000
Fibre cans, tubes and drums	65,199,000	72,165,000	192,600,000	193,081,000
Solid-fibre and corrugated shippers	213,523,000	835,194,000	1,700,188,000	1,680,000,000
Fibre food trays, including egg cartons	4,650,000	7,600,000	25,520,000	25,520,000
Corrugated paperboard (sheets and rolls)	10,700,000	17,591,000	59,500,000	58,800,000
Flexible Packaging Materials (total)	**103,127,000**	**256,214,000**	**993,030,000**	**985,470,000**
Papers (for wrapping)	63,127,000	178,214,000	361,650,000	357,000,000
Cellophane (unconverted)[1]	40,000,000	78,000,000	274,680,000	276,570,000
Polyethylene (unconverted)[1]			132,500,000	133,500,000
Others[2]			61,000,000	64,000,000
Aluminum foil, flexible (packaging uses)			163,200,000	154,400,000
Metal Containers and Components (total)	**401,388,000**	**852,999,000**	**2,278,546,000**	**2,180,342,000**
Metal cans	339,413,000	619,406,000	1,692,018,000	1,641,942,000
Collapsible metal tubes and caps	8,398,000	23,772,000	43,272,000	42,400,000
Rigid foil containers			27,400,000	29,700,000
Steel shipping drums, barrels, kegs, pails	53,577,000	171,545,000	273,536,000	240,500,000
Reconditioned barrels and drums			106,100,000	98,700,000
Steel strapping and accessories			101,850,000	91,450,000
Compressed gas cylinders		38,276,000	34,370,000	35,650,000
Aerosols[3] (total)			**96,000,000**	**114,700,000**
Nonfood			88,000,000	107,200,000
Food			8,000,000	7,500,000
Glass Containers (total)	**156,365,000**	**422,963,000**	**901,594,000**	**907,700,000**
Closures (total)	**47,872,000**	**134,185,000**	**268,355,000**	**254,081,000**
Metal caps	25,758,000	45,918,000	116,048,000	113,095,000
Metal crowns	22,114,000	60,429,000	93,082,000	84,100,000
Milk bottle caps, paper & metal		20,136,000	26,180,000	24,600,000
Plastic commercial closures		7,702,000	33,045,000	32,286,000
Rigid and Semirigid Plastic Containers (total)			**81,100,000**	**135,878,000**
Plastic bottles			25,600,000	73,658,000
Plastic tubes			1,000,000	1,000,000
Rigid plastic containers, except bottles, tubes			36,000,000	42,400,000
Plastic carboys			4,000,000	3,720,000
Plastic sheet[4]			14,500,000	15,100,000
Wooden Containers (total)	**181,668,000**	**550,200,000**	**447,803,000**	**423,530,000**
Wooden boxes	126,019,000	406,986,000	341,383,000	314,000,000
Cooperage (tight and slack)	34,569,000	101,981,000	72,117,000	75,800,000
Fruit, vegetable baskets	15,224,000	31,741,000	26,003,000	25,430,000
Cigar boxes	5,856,000	9,492,000	8,300,000	8,300,000
Textile Containers (total)	**110,504,000**	**334,335,000**	**191,018,000**	**207,730,000**
Component Materials (total)	**153,182,000**	**435,365,000**	**999,245,000**	**1,024,643,000**
Adhesives (for packaging)		77,916,000	113,700,000	125,070,000
Labels, seals and tags	136,626,000	241,934,000	580,750,000	598,172,500
Pressure-sensitive and gummed tape	16,556,000	65,853,000	270,850,000	270,850,000
Cotton, soft- and hard-fibre wrapping twine		49,662,000	33,945,000	30,550,500
Packaging Machinery (total)	**16,204,000**	**127,893,000**	**170,000,000**	**187,000,000**
TOTAL	**$1,721,852,000[5]**	**$5,178,233,000[5]**	**$11,110,982,000**	**$11,125,185,000**

* Source: Based on information from Government and industry organizations, with special assistance from Ford Sammis & Co., marketing economists. Because Census of Manufactures data were not available at time of preparation, many of the totals for 1960 were computed on the basis of changes in unit volume.
1 For value of converted film, see table on p. 24.
2 Includes Pliofilm, polyester, saran, cellulose acetate, vinyl, etc.
3 Includes container, valve, cap and propellant.
4 Sheet for thermoformed or fabricated packages, but does not include cost of forming, etc.
5 Because of the incompleteness of reported packaging statistics, several important categories are omitted from this total.

Estimated production or shipments of selected containers or packaging materials—1940, 1950, 1959, 1960

Type of container	*1940*	*1950*	*1959*	*1960*
CONSUMER				
Tinplate cans (1,000 tons, steel)	2,192	3,893	4,949	4,801
Aerosols, all types (1,000 units)	—	50,000	655,000	745,000
Metal crowns (1,000 gross)	143,929	343,377	322,727	292,333
Metal caps (million units)	5,677	11,638	15,418	14,884
Plastic closures[1] (million units)	n.a.	2,555	3,014	2,962
Glass containers (1,000 gross)	52,116	106,380	153,993	156,799
Collapsible tubes (1,000 gross)	2,333	6,449	7,986	7,829
Paper milk bottles (tons)	n.a.	219,920	540,347	577,629
Hood, lid covers (tons)	n.a.	26,871	12,232	13,366
Milk-bottle plugs (tons)	n.a.	18,197	18,680	19,390
Liquid-tight containers (tons)	n.a.	47,308	32,314	37,530
Round, nested containers (tons)	n.a.	106,219	261,088	263,511
Ice-cream, frozen-food, butter cartons (tons)	n.a.	189,389	369,084	368,283
Folding paper boxes (1,000 tons, bd.)	1,398	2,356	2,904	2,905
Set-up paper boxes (1,000 tons, bd.)	613	709	805	799
Fibre cans and tubes (1,000 tons, bd.)	n.a.	245	282	288
Paper bags—grocery, variety, specialty (1,000 tons, paper)	606	760	1,158	1,247
Aluminum foil converted (million lbs.)	n.a.	n.a.	231	227
Molded plastic containers (million lbs.)				
Polyethylene bottles, jars, tubes	n.a.	n.a.	32	65
Polystyrene containers	n.a.	n.a.	68	80
Transparent packaging film				
(total, million lbs.)	n.a.	300	737	763
Cellophane	110	265	436	439
Polyolefins	—	n.a.	247	267
Other plastic films	—	n.a.	54	57
SHIPPING				
Steel drums, pails (1,000 tons, steel)	572	925	773	841
Nailed wooden boxes (million bd. ft.)	4,295	5,000	3,700	3,330
Wirebound boxes (1,000 units)	28,175	158,087	188,000	185,000
Slack cooperage (1,000 units)	35,000	23,370	18,540	17,000
Tight cooperage (1,000 units)	9,675	4,472	2,400	2,544
Metal strapping (1,000 tons, steel)	100	350	345	310
Corrugated, solid-fibre containers (1,000 tons)	3,114	5,830	8,441	8,649
Fibre drums (1,000 units)	3,500	26,000	29,200	28,400
Paper shipping sacks (1,000 tons paper)	195	743	870	859
Textile bags (million yds.)	1,538	1,158	945	880
Gas cylinders (1,000 tons, steel)	n.a.	97	76	56
Veneer packages (million sq. ft. veneer)	1,529	1,100	1,045	1,025

SOURCES: U. S. Dept. of Commerce, Bureau of the Census, trade associations and industry.
1 Excludes caps for collapsible tubes. n.a. = Not available.

worker in all manufacturing industries; metal cans led, averaging $25,480 (1954 dollars) per worker. Output in the same industries exceeded the average output in all years reviewed, with paperboard containers added in 1947, and sanitary goods containers added in 1954 and 1958.

The average real gain in output per production worker in packaging increased an average of 70% over the past 20 years whereas all manufacturing industries increased 57%, with both the durable and nondurable segments below the average of packaging. All major segments of the packaging field experienced an increased output per worker from 1939 to 1958, led percentagewise by wooden containers and metal shipping containers. With the exception of textile bags, output also increased for each Census year.

The major factor responsible for this increased productivity in packaging has been the introduction of efficient, high-speed production machinery and handling equipment. Also, the development of new containers and packaging materials has led to new efficiency. The real meaning or impact of these factors can be understood more easily when the 1939 output rate of production workers is translated into 1958 constant dollars. This would mean, for example, that container industries would have to increase the labor force of production workers from about 325,000 for the industries analyzed to over 550,000 to achieve the 1958 level of sales.

Review of 1960

Although container business picked up during the final quarter, the 1960 annual volume dropped 2% below the record 1959 level. Business declined from 1959 for each of the previous quarters with the third down 5%. Major percentage decreases for the year occurred in metal shipping barrels, drums and pails and nailed wooden boxes. In contrast, record volume was experienced in converted flexible packaging products, fibre cans and tubes, set-up paper boxes, glass containers and rigid aluminum-foil containers.

Compared with 1959, metal containers output-deliveries declined an average of 4%, led by a 10% decrease in barrels, drums and pails. Similarly, paper and wooden container industries activity declined 2% and 5%, in that order. In the paper container group, record operations of fibre cans and tubes and set-up paper boxes were off-

set by decreases in all other major industries. In the wooden container group, decreases averaged 5% with all major segments down except tight cooperage; nailed wooden boxes and crates decreased about 10%. Converted flexible packaging products increased 3%. Glass containers gained 2%. Packaging closure shipments declined 8%.

Labor costs of container manufacturing in 1960 were up 2 to 3% from 1959, based on average hourly earning in selected container industries.

Container prices in 1960 varied, with paper and paperboard containers and packaging materials generally higher—led by gum sealing tape, up 5%. Set-up paper boxes and corrugated shipping container prices were up about 1% from 1959 quotations as were folding paper boxes by 2%. Glass container wholesale price index was down 2.7% and that of 55-gal. metal drums by 4.3%. Rigid aluminum-foil container prices were down about 1%. Converted flexible packaging products, textile bags, and 12-oz. metal beer-can prices were up from 1959. Raw material costs varied as follows: wood, down; plastic films, down; metal, unchanged to higher; cotton and burlap, higher; boxboard, varied—set-up higher, folding and containerboard down; soda ash and glass sand, unchanged.

U. S. foreign trade in containers, packaging materials and machinery reached a new high in 1960. Exports amounting to $156.2 million exceeded both 1959 and the previous high of 1958 by approximately 6%. Imports amounting to $22.1 million exceeded the record 1959 value by almost 12%. Canada remained the principal consumer of U. S. containers, taking $47.1 million, or 30% of total exports. West Germany was the major supplier of containers and materials to the U. S., receiving $5.8 million, or more than 25% of the value of all imports.

Outlook

Container activity for the first half of 1961 approximated the same period of 1960, despite a comparatively slow first quarter. It appeared (at time of writing) that container business for 1961 would exceed the 1960 volume and possibly equal the record 1959 total. Record operations, for example, were anticipated by the glass container and rigid aluminum-foil industries. Also, a possible record volume was foreseen in fibre boxes, metal cans, and converted flexible packaging products. Business operations of the

End-use distribution of selected containers

	% of shipments 1	
	1959	1960
ALUMINUM FOIL		
Medicinals, pharmaceuticals	0.6	0.6
Dairy and edible oils	7.2	7.3
Frozen and pre-cooked foods	32.8	36.4
Dried and dehydrated foods	1.4	1.3
Military packaging	1.1	0.7
Bakery and milling products	5.3	4.5
Dry foods	1.6	1.6
Tobacco	15.3	13.2
Confections and snack foods	6.7	6.5
Meat, poultry, seafoods	0.6	0.5
Food products, unclassified	1.9	2.0
Nonfoods	5.1	4.3
Labels, tags, seals, beverage wraparounds	6.7	6.4
Fancy paper, gift wraps	6.8	8.2
Liners, closures	6.8	6.4
Vegetables, fruits, juices	0.1	0.1
FOLDING PAPER BOXES		
Armed Forces and Quartermaster	0.1	0.2
Medicinal products	4.0	3.7
Cosmetics and personal accessories	2.4	2.5
Soap	11.9	12.2
Food, except candy or baked goods	23.3	23.7
Candy or confectionery	4.5	4.6
Crackers or baked goods	10.1	10.4
Tobacco and related products	3.1	2.5
Hardware, appliances and automotive supplies	5.6	5.5
Sporting goods and toys	1.3	1.3
Textiles and apparel	4.6	4.6
Retail boxes	3.6	4.0
Laundry boxes	0.3	0.5
Rubber goods	0.9	0.8
Beverages	9.9	9.9
Paper goods or products	9.3	10.0
Miscellaneous	4.3	3.6
SET-UP PAPER BOXES		
Cosmetics	4.1	5.1
Confections	9.6	7.3
Drugs, chemicals, pharmaceuticals	2.3	6.3
Textiles, wearing apparel & hosiery	29.0	24.1
Department stores and other retail stores	15.3	15.3
Jewelry and silverware	1.8	4.9
Stationery and office supplies	7.3	7.2
Hardware, household and auto supplies	6.9	6.7
Toys and games	2.0	2.7
Shoes and leather goods	6.2	5.0
Food and beverages	1.2	1.2
Photographic products and supplies	3.1	3.9
Sporting goods	1.1	1.0
Other major customers	4.3	2.9
Miscellaneous	5.4	6.4
GLASS CONTAINERS		
Food	39.5	39.5
Medicinal, health supplies	14.1	13.3
Household, industrial	8.7	8.4
Toiletries, cosmetics	8.8	8.9
Beverage, returnable	6.4	6.2
Beverage, nonreturnable	1.0	1.1
Beer, returnable	2.0	1.9
Beer, nonreturnable	6.5	8.6
Liquor	6.8	6.3
Wine	3.2	3.2
Dairy products	1.3	1.2
Packers' tumblers	0.3	0.3
Direct export	1.7	1.4
TINPLATE CANS		
Fruit, vegetable, juice	31.6	31.9
Evaporated, condensed milk	4.1	4.1
Other dairy products	0.6	0.5
Meat, including poultry	3.0	3.0
Fish, seafood	2.3	2.6
Coffee	4.5	4.5
Lard, shortening	2.2	1.9
Soft drink	1.0	1.5
Beer	18.2	18.0
Pet food	3.6	3.8
Oil, open top, 1 qt., 5 qt.	5.9	5.1
All other food	10.2	11.2
All other non-food	12.8	11.9
COLLAPSIBLE TUBES		
Medicinal, pharmaceutical	21.6	20.8
Cosmetics	9.1	10.0
Shaving cream	3.4	2.8
Dentifrices	50.5	51.3
Food products	0.1	0.1
Household, industrial	15.3	15.0

	% of shipments 1	
	1959	1960
CORRUGATED AND FIBRE SHIPPING CONTAINERS		
Beverages	3.2	3.5
Food and kindred products	24.7	24.7
Tobacco	0.8	0.8
Carpets, rugs and other floor covering	0.5	0.5
Textiles (except carpets, rugs, etc.)	3.2	3.2
Apparel	1.5	1.4
Lumber products, except furniture	1.0	0.8
Household furniture	3.1	3.8
All other furniture and fixtures	1.8	1.6
Paper and paper products	9.6	9.9
Printing, publishing and allied industries	1.3	1.5
Soaps, cleaners, cosmetics, perfumes, etc.	2.6	2.9
Paints and varnishes	0.6	0.6
Chemicals and allied products (except paints and varnishes, and soaps, cleaners, perfumes, cosmetics, etc.)	2.7	2.8
Paving and roofing material	0.8	0.7
Products of petroleum and coal (except paving and roofing material)	1.1	1.0
Rubber and miscellaneous plastics products	2.0	1.9
Leather products	0.5	0.4
Stone, clay and glass products	9.1	8.6
Primary metal products	1.2	1.1
Fabricated metal products	7.1	6.9
Service-industry machinery	1.1	1.0
Other machinery (except electrical and service industry machinery)	1.9	1.5
Electrical machinery, equipment and supplies	2.7	2.5
Electrical appliances	2.8	2.5
Communication equipment and related products	1.1	1.1
Transportation equipment (except motor vehicles and motor vehicle equipment)	0.8	0.7
Motor vehicles and equipment	3.0	3.1
Professional and scientific instruments	0.6	0.7
Toys, sporting and athletic goods	1.6	1.6
Miscellaneous manufacturing (except toys, sporting and athletic goods)	5.7	6.4
Government	0.3	0.3
MULTIWALL PAPER SACKS		
Agricultural, food	32.2	32.5
Building materials	19.6	18.3
Chemicals, drugs	37.9	38.8
Minerals	8.0	8.0
Miscellaneous	2.3	2.4
TEXTILE BAGS		
Feed	29.2	33.6
Potatoes	10.9	12.6
Flour	20.7	16.7
Meal	5.3	6.5
Fertilizer	3.1	3.8
Seeds	6.7	5.9
Rice	4.7	5.0
Beans, peas	2.9	2.8
Other	16.5	13.1
STEEL BARRELS, DRUMS		
Adhesive, glue, cement, ceramic	1.4	0.8
Armed Services, direct	2.4	3.0
Chemical	47.8	50.4
Food	4.8	3.4
Industrial maintenance, janitor supplies	2.2	2.3
Oil	28.9	27.5
Paint	5.7	5.0
Printing ink	0.1	0.1
Roofing material	1.8	1.8
All other	4.9	5.7
STEEL PAILS		
Adhesive, glue, cement, ceramic	7.3	6.9
Armed Services, direct	0.1	0.3
Chemical	18.9	19.8
Food	4.5	4.5
Industrial maintenance, janitor supplies	5.3	5.2
Oil	17.6	18.1
Paint	29.3	28.8
Printing ink	4.1	3.5
Roofing material	3.1	2.9
All other	9.8	10.0

Sources: U. S. Dept. of Commerce and industry.
1 In some instances, percentage of production is given.

Change in number of production workers in packaging compared with total manufacturing 1939-1958

Industry sector	*Percentage change, 1958 compared with*		
	1954	*1947*	*1939*
All manufacturing industries, average	− 7	− 9	+ 42
Durable goods	− 9	− 7	+ 68
Nondurable goods	− 5	−11	+ 19
Packaging, average	+ 0.4	+ 3	+ 40
Textile bags	−24	−38	− 37
Wooden containers	−27	−42	− 37
Veneer and plywood containers	−19	−42	− 44
Cooperage	+ 2	−60	− 52
Bags, other than textile	+14	+62	+186
Paperboard containers	+ 3	+17	+ 77
Sanitary food containers	+20	n.a.	n.a.
Fibre cans, tubes, drums, etc.	−12	+14	+ 39
Glass containers	+10	+16	+ 89
Metal cans	− 2	+15	+ 60
Metal barrels, drums, pails	−17	−23	+ 19
Collapsible tubes	−13	− 3	+ 74

n.a. = Not available

Annual shipments of converted flexible packaging products, 1959-60 (thousands of dollars)

Product by types of materials used	*1960*	*1959 (revised)*
Total	514,529	497,948
COMMERCIAL PACKAGING, TOTAL	492,356	474,110
Bags, pouches, envelopes, drum liners, blankets, and tubes; plain or printed, waxed or unwaxed, total	266,071	263,088
Cellophane (unsupported)	37,608	37,085
Polyethylene (unsupported)	94,966	91,336
Polyethylene combined with other films by lamination or coating	15,298	15,879
Polyethylene combinations with paper, foil, and foil combinations; foil combinations of papers, and films other than polyethylene	8,916	9,188
Kraft or sulphite paper, single or in combination with other paper; kraft sulphite or greaseproof paper in combination with plastic films other than polyethylene; other plastics (unsupported) (acetate, vinyl, polyester film, etc.)	73,388	73,424
Glassine, greaseproof, and parchment, laminated or unlaminated, including waxed or unwaxed, plain or preprinted waxed paper	35,895	36,176
Printed rolls and printed sheets, except laminated or coated structures, total	107,718	108,690
Cellophane	61,452	66,654
Paper, all types	28,905	29,752
Polyethylene	12,545	12,284
All other material, including unsupported foil	4,816	
Laminated or coated rolls and sheets, plain or printed (excluding unprinted paper-mounted foils for cigarettes and chewing gum wraps, and bottles, can and canister labels) total*	118,567	102,332
Foils laminated and/or coated with polyethylene	14,848	26,637
Foils laminated and/or coated with materials other than polyethylene	49,830	43,251
Polyethylene laminated to or coated with materials other than foil	15,311	n. a.
Laminated and coated films and paper (excluding polyethylene and foil)	38,556	32,392
RESALE HOUSEHOLD BAGS	12,099	12,427
MILITARY SPECIFICATIONS	10,074	11,411

Source: Bureau of the Census.
*Detail does not add to the total because of the inability of some respondents to report details.
n.a. = Not available.

folding paper box, paper milk container, and steel shipping barrel, drum and pail industries were expected to equal or possibly exceed the 1960 volume. The defense buildup, it was felt, would stimulate economic activities and this in turn would keep packaging up and eventually move many container volumes into new high levels.

Cost trends. Container prices during the first quarter of 1961 were generally higher than in the corresponding period of 1960. Increases were reported in textile bags, converted flexible packaging products and paper containers. Metal cans and foil were higher. Glass container prices were down, wooden container prices unchanged. Drums and aluminum collapsible tubes were lower.

However, compared to fourth-quarter 1960 prices, most containers during the first part of 1961 were unchanged to higher. After mid-year, 1961, many corrugated box manufacturers announced price rises of from 10 to 14%. Kraft prices rose. Prices of papers, films and foils had held steady during first half 1961 (see p. 17), but a significant price drop occurred for polypropylene film. Also, higher yield cellophanes were made available, and the net effect was lower material costs for applications affected.

As shown in the accompanying table the dollar value of shipments of converted flexible packaging products has moved ahead for the years reported (1959-1960). Sales of the industry have made healthy progress as compared with two major economic indexes. For example, total annual sales increased from $352.5 million in 1955 to $514.5 million in 1960, a gain of 39% against comparable gains of 26 and 28%, respectively, in gross national product and personal expenditures.

The converted flexible packaging products industry is composed of some 375 establishments throughout the country. They convert papers, films and foil into packages and package components by means of bag making, printing, laminating and coating. Two of the faster-growing converting operations are the manufacture of polyethylene bags and of laminated or coated rolls and sheets.

Other segments of the packaging field that are exhibiting fast growth include the production and use of plastic bottles, thermoforms, molded polystyrene containers and aerosols. (See also the tables appearing on pages 21, 22, 392 and 393.)

Advertisers' Index by Subject Matter

DEVELOPING SUCCESSFUL PACKAGES

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SECTION 2

DEVELOPING SUCCESSFUL PACKAGES

PLANNING YOUR PACKAGE

by W. H. Enzie*

Too often, a package is designed and put into production with little or no consideration given to marketing problems and opportunities. The marketing man, in turn, may become impatient with the package designer's timetable because he is unaware of the many steps that must be taken to develop a package structure and design that provides adequate product protection, is marketing oriented, and which also can be produced at a cost that permits the product to be priced competitively.

It is reasonable to assume, too, that administrative executives concerned with costs may question the need for substantial expenditures for market research, laboratory testing, and other costs involved in package planning and development.

This article is intended, therefore, to provide proper perspective in the planning and development of packages for everyone in industry who is, in one way or another, concerned with product packaging.

Package planning, as it is known today, represents a relatively new technology in the manufacture and merchandising of foods, clothing, drugs, instruments and the many other items that flow from our production complex. In the early 1900s, there was little choice of packaging materials except for wood, natural fibres, glass and tinned steel cans. Marketing of consumer products as we now know it, with a multitude of consumer items competing for the shopper's attention and often in self-service stores, did not exist and there was less need for package planning with consumer appeal in mind.

The packaging of foods and drugs undoubtedly involves more problems and factors to be considered than is the case with other products. In planning packages for nonfood items, many of the criteria established for planning of food packages will, of course, be applicable. A logical point of departure in gaining a fresh perspective on package planning for any product is, therefore, a review of package planning as it should be conducted in the field of foods.

More than 100 years ago, the first "canned" foods were supplied to Napoleon's soldiers, and later became civilian consumer items. Actually, they were packed in glass jars. The "tin can" came later. Glass still has protective properties no other material can match or exceed, and glass containers will be with us for the foreseeable future.

They do, however, have shortcomings as used in today's large-scale food processing and marketing. Some of these shortcomings have been reduced through research, and others may yield to some degree as the result of future developmental work. Fragility presents problems in high-speed packing lines. Glass containers can be mass-produced economically only in a cylindrical shape, and this shape wastes about 25% of the space in a shipping carton or on a store shelf. Glass is heavy and increases shipping costs. Jars are more difficult to handle than many newer types of packages, and labor costs in food stores thus are affected. The curved surface does not provide as effective display of product identification, and the label may be turned to the rear when shelved.

Long ago, too, the can took its rightful place on grocery shelves alongside the glass container. Being cylindrical, it shares that shortcoming with the glass jar. Also, it will dent and it lacks transparency. Its strength and light weight are major assets. Both glass and metal containers are low in cost and have been so maintained by continuance of manufacturing efficiencies.

The volume production of paper cartons and containers at reasonable cost gradually nudged the barrels and bins out of the food stores, and bulk display of flour, sugar, crackers and other consumer items eventually gave way to the more sanitary and convenient individual carton which we know today.

In recent years, the availability of new, flexible materials has permitted packaging to take rapid forward strides. The introduction of many new foods, or foods in new forms—frozen foods, cake mixes, ready-mix desserts, for example—has required the improvement of older-type packaging materials, the use of new materials, and in some cases the wedding of several different materials. Packaging has become a complex science and today's packages are being engineered by experts from many fields working together.

Early planning essential

The importance of early review of all known factors to be considered in developing packaging for new or improved products is increasingly recognized, especially in the field of consumer products. Package development goes hand-in-hand with product development, and no longer can the package be regarded as just simply a convenient means of enabling a prod-

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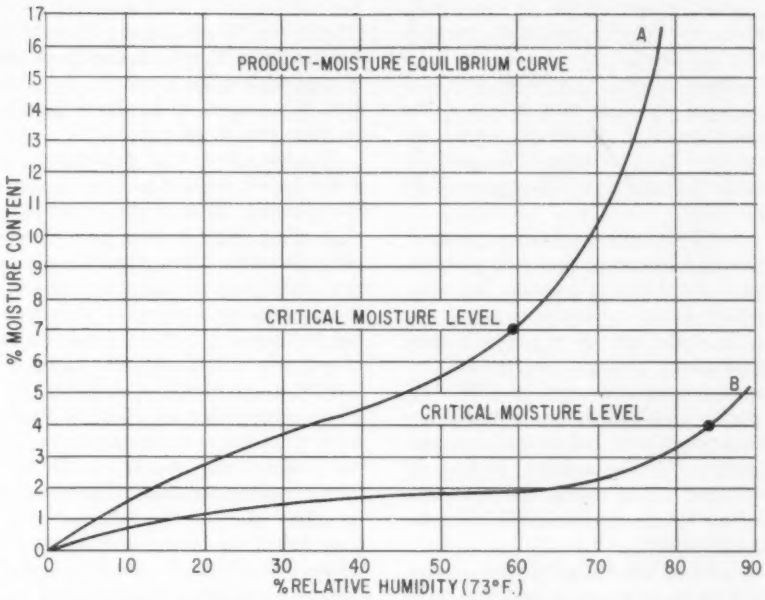
uct to be transported from where it is produced to where it is sold or consumed.

A successful technique for a practical approach to package planning is to separate the over-all job into three categories:

1. Marketing considerations
2. Product protection
3. Economic factors.

The next step is to establish a list of criteria for each of these categories against which packaging concepts can be measured. To accomplish this, it is necessary first to establish what is expected and needed in a package for the particular product involved.

Using these criteria, logical and economic packaging concepts can be evaluated to provide the optimum combination of properties, design characteristics and production cost to meet the packaging requirements established for the product.



TYPICAL MOISTURE CURVES for hygroscopic product (A) and nonhygroscopic (B)

Marketing considerations

Thousands of products, both old and new, are competing for a position on food store shelves and there is not room for them all. The product that wins against others in the race is the product that has been both developed and packaged so it actually is marketing oriented.

The success of package planning, therefore, depends on identifying all important criteria that enter into marketing considerations. Since the first sale of the product must be to the retailer, factors important to him always must be given early consideration in package designing. These include:

1. Shelf stacking characteristics and shelf space required
2. Ease of price marking
3. Quantity of packages per case
4. Ease of case identification
5. Ease of removing packages from case for shelving
6. Pilferage protection achieved through package size and design, especially where small items have relatively high value
7. Resistance to package failure or product spoilage.

Consumer convenience

Having made sure that the package and case conform to the retailer's requirements, full attention then must be given to consumer reactions to the package. If the product does not move and turn over at a rate profitable to the retailer, it soon will lose its position on store shelves.

A thorough understanding of how and where the product is used is a most important factor in establishing packaging criteria. Misconceptions or inadequate information concerning ultimate use of the product, and the steps the consumer must go through to use it, can spell failure for that product. Thorough analysis and understanding of consumer use is needed to identify clearly the advantages of one type of package over another. Examples of this:

1. Will special opening, pouring or reclosure devices make it easier to use the product?
2. Are the package size and shape suitable for storage facilities normally found in the home?
3. Is the package easy to carry, easy to handle, easy to open?
4. If directions for preparation or use are important, are they easy to read and readily understandable?
5. Can the package provide extra use convenience, such as boilable bags for heating foods, or aerosols for ease of use?
6. Are there secondary use possibilities such as packing the product in glass containers that can later be used as juice glasses, or in plastic containers that later can be used for refrigerator food storage?
7. Is the package able to be disposed of readily?

Display. Shelving and store lighting conditions vary considerably from store to store, and from one store section to another.

In self-service stores especially, graphic design of the package is of great importance. Under all lighting and shelving conditions, the package must do a selling job, and this calls for the best in design. The product must be identified quickly and easily, even when stacked flat. The price must be easy to locate and read, and design should provide eye-catching qualities important in producing impulse sales. The basic structural design of the package must provide the graphic designer with the opportunity to produce such a package.

Usually, the package should be planned to be recognizably better than competitive product packages. In a section where a variety of competitors' packages are "shouting" for attention through busy design and riotous colors, a plainer, quieter package may stand out. Conversely, where a line of products has traditionally been sold in packages that are drab and ultra-conservative, a package with a modern design may attract the impulse buyer.

Optimum image. A deciding factor in considering a new package may be the product image already established in the consumer's mind.

Knowledge of consumer attitudes in this area is invaluable in planning

a package acceptable to consumers, and considerable consumer research may be necessary.

Since this is an involved phase of package planning, only a few of the questions that should be raised are outlined here to suggest the part the product image should play in package planning.

1. Should the package suggest by design a deluxe or premium product, or does a theme of economy and practicality fit the marketing concept?

2. Might use of a radically new packaging concept create barriers against consumer acceptance? For example: edible films are available for wrapping foods, but is the consumer ready to "eat the package," and would the cost of educating the consumer to try to accept the edible film be worth-while?

3. Does the proposed size, shape, or type of bottle for a food, say salad dressing, conjure up an image of a different type of product—such as a shampoo?

4. Would a food product packed in an aerosol container meet with resistance because of consumer identification with insecticides or shaving creams?

These are but a few of the possibilities that must be considered, analyzed and, if possible, tested through consumer research in developing the new package.

Product protection

Since the first requirement of packages is to deliver the goods to store shelves and consumer cupboards in good condition and at lowest cost, the important new materials available today should be considered.

Food manufacturers today work closely with paper companies, chemical manufacturers and producers of other packaging materials, such as plastics and aluminum foil. Many of these suppliers have applications research laboratories to work out packaging problems in cooperation with independent package design firms and with the packaging laboratories of their customer-manufacturers. Frequently there is a wedding of several materials to provide the exact properties needed.

An example of such an approach will suggest the possibilities of modern packaging technology.

A dry salad-dressing mix, made in six different flavor combinations, contains spices and seasonings. The mixes have delicate fugitive flavors that must be retained within the envelope until the consumer is ready to use the mixes in preparing salad dressings. For this line of products, a five-layer flexible package was developed.

The outer layer is a reverse-printed cellophane laminated to paper to protect it and to enhance the appearance of product identification, and a full-color illustration. The paper is used to provide package strength and rigidity. It is laminated, in turn, to aluminum foil by means of a thin, extruded film of polyethylene. Lastly, the inside of the foil is coated with a vinyl lacquer. The foil provides an effective flavor barrier needed to retain the flavors of the product, and also is an effective barrier against moisture. The plastics on either side of the foil protect it from losing its barrier characteristics while being formed, filled and distributed. The vinyl lacquer used on the inside is compatible with the food with which it is in contact. Additionally, it is heat sealable.

In this package, each material was selected to provide certain needed properties, functions or economic qualities. The results have been highly successful—as proved by shipments of millions of cases over an extended period.

Sometimes new ideas provided by makers of packaging materials are excellent except for one thing—they are not marketing oriented. The manufacturer of foods and other consumer goods must always consider the product image that has become established in the consumer's mind. To deliver an established product in a form unfamiliar—and perhaps unacceptable—to the consumer is to invite marketing disaster.

Other good packaging ideas may not turn out to be usable because they are not suitable for high-speed production lines.

When planning a package in cooperation with a manufacturer of packaging materials, there must be a combination of knowledge in which the packaging expert combines his know-how in the field of materials with the production and marketing skills of the consumer goods manufacturer.

Special protective factors

There are special factors to consider in planning a package for product protection. These include:

Water-vapor protection. Products requiring water-vapor protection fall into two categories: dry products and products having high moisture content. The first, such as cereal, crackers or dehydrated foods, needs a barrier to keep water-vapor out of the package. The second, such as frozen foods, bread or tobacco, needs a barrier to prevent loss of moisture.

Protecting a product from water-vapor transfer—in or out—usually increases package costs in ratio to the degree of protection needed. It is important, therefore, to establish the optimum level of protection required for any particular product.

The critical moisture level must be determined for a dry product, taking into consideration the levels at which caking, toughness or odor development occur.

Shelf life required of the product also must be considered. Since water-vapor transfer is a function of time, the expected shelf life must be taken into consideration in establishing the degree of protection required.

Climate is a factor, too. The degree of protection needed against water-vapor transfer is higher in the humid climate of southern Florida or the Texas Gulf Coast than in the northern states. Similarly, protection against drying out of product or package may be needed in certain areas during cold winter weather. Sometimes it is more economical to provide a special package for products shipped to the southern region, while a less costly package can provide a sufficient protection for the product to be sent to other parts of the country.

While available test data can be a guide to selection of packaging materials to provide the required degree of protection from water-vapor transfer, nothing can take the place of actual field tests.

Packages made in the laboratory will, in many cases, provide considerably more protection than when machine formed and subjected to the rigors of production packing, shipping and handling.

Greaseproofness. The degree of grease protection required can usually be identified by laboratory testing. To provide the required level of protection in production runs, the effects of physical treatment of the packaging material during the set-up must be considered because the operation can have a pronounced effect on grease-barrier properties.

Infestation. Products subject to insect infestation must be protected

through use of proper packaging materials and structural design of the package.

Strength. The physical strength of a package must be sufficient to stand the normal mechanical hazards of shipment and distribution: impact, shock, crushing and vibration. Climatic conditions and standard use cycles also are factors to consider. There are numerous test methods that can be used in the laboratory to develop a package with the required strength specifications.

Pilferage. With the increase in self-service stores in recent years, pilferage has become an ever-present problem. Especially in the case of small items which have relatively high value, the package should be so designed that its size or shape will help to discourage pilferers.

Odor. Products subject to ready odor loss or pickup should be protected by materials with low rates of gas transmission. The manufacturer of products that readily absorb odors has no assurance that his products will not be stored or displayed next to odoriferous products, and this is another reason why he must provide adequate protection.

Contamination. In packaging foods, drugs or cosmetics, full consideration must be given to safety. Safety is of utmost importance and is under the constant scrutiny of the Government. Where there is the slightest possibility for migration of any components of the package into the product, extra attention must be given to assure safety. There are plastic films, for example, which are excellent materials for containing many products. There is, however, a question that when in contact with certain foodstuffs migration might take place. If so, these materials should not be used for such foods until exhaustive animal feeding tests have established that it is safe to do so. Avoidance of contamination must be kept in mind when any planning and selecting of coupons or premiums is being done.

This is an area in which there can be no compromise or guesswork. The package planner must know.

Gas transmission. The presence of oxygen with some foods can cause development of off-flavors and odors. The elimination of oxygen is necessary, therefore, for extended shelf life of such products. In some cases, such as in packaging dry-frozen or freeze-dried products, it is necessary to expel all oxygen from the package and replace it with an inert gas, usually nitrogen. Metal and glass provide the maximum level of protection against gas transmission—in or out—in the finished package. Flexible packaging materials, such as foil, have excellent gas-barrier properties in the flat, but may lose some of these properties in the package-forming operation. When these materials are used, this must be taken into consideration.

Effect of light. Many products require protection against light. Foils, opaque plastics, paper, metal and colored glass provide such protection, and can be specified according to product needs.

Economic considerations

Packaging costs are, of course, a factor that must be considered to a greater or lesser degree, depending on the product. In the case of an expensive instrument, a metal-cutting tool, an electronic component, or a piece of jewelry, the cost of the package itself may be relatively unimportant. In fact, an expensive-looking package may be a factor in making sales. Moreover, it is false economy to save pennies and sacrifice protective properties in designing a package to contain costly products such as those mentioned above. An adequate package must be provided regardless of extra cost.

For mass-produced consumer goods such as foods, however, cost of the container is of great importance, especially in the light of price competition and small profit margins.

Over-packaging and under-packaging can be unnecessarily costly. An important factor in relating package design to costs is, therefore, accurate identification of the kind and degree of protection required.

Some of the factors to be considered when evaluating the economics of any package are:

- Costs of packaging materials
- Costs of fabrication of the package itself
- Usability of existing equipment in forming and filling
- Added or reduced manpower
- Inventory, shipping and storage costs
- Requirements of an adequate case to contain the packages
- Refunds and allowances for damaged products
- Obsolescence factors indicated by known or anticipated trends in materials, machinery, methods and marketing requirements.

Because there are so many and such complex factors to be considered in developing or improving a package, the goal should be to arrive at a design that provides the best combination of marketing effectiveness, product protection, and costs.

The final measurement of effectiveness of a complete package or of package components is always in commercial experience. No commercially effective package can be designed to give 100% performance under all conditions. It is, however, necessary to find a design that represents the optimum in protection, consumer acceptance and packaging costs.

New developments

Each day, new packaging ideas and new materials are becoming available to those who are responsible for package planning.

New types of aerosol propellants are being developed to be compatible with various food contents. This could open up whole new fields of packaging possibilities.

New uses are being found for the newer materials. Foam styrene, for example, has been widely used to provide protection against impact and shock in packaging expensive tools and instruments, and other industrial products. Today it is being molded into containers for cosmetics and jewelry, not only for the protection it provides but also for the eye appeal that stimulates sales.

Aluminum containers with pull tabs for quick and easy opening already are here. Frozen orange concentrate and sardine containers are two examples of their use.

As new methods of preserving foods come into wider use, new packaging problems, new materials and new methods will appear.

Aseptic packaging already is here on a limited scale. This packaging technique permits foods to be shipped and stored without dehydration, refrigeration or freezing. The flexible packaging material is sterilized by chemicals, the food by cooking—and the two brought together under sterile conditions.

Dehydro-freezing and freeze drying each present new packaging requirements and, as these preservation processes come into more extensive use, an entire new phase of packaging may develop.

Standard tests for packaging materials

The tests enumerated here were selected from general lists supplied by the American Society for Testing and Materials (ASTM), 1916 Race St., Philadelphia 3, Pa.; the Packaging Institute, Inc. (P.I.), 342 Madison Ave., New York 17, N.Y.; the Technical Assn. of the Pulp & Paper Industry (TAPPI), 360 Lexington Ave., New York 17, N.Y.; and various Government and military agencies.

Additional sources for packaging tests include Federal Standard No. 101a, available from the General Services Administration, Washington 25, D.C., plus standards and tests prepared by branches of the Armed Forces including the Naval Air Material Center, Philadelphia 12; The Quartermaster Food & Container Institute for the Armed Forces, 1819 W. Pershing Rd., Chicago 9; The Chemicals & Plastics Div., Quartermaster Research & Engineering Center, Natick, Mass.; and the Ordnance Corps, Picatinny Arsenal, Dover, N.J.

1—Paper and paperboard[1]

	Federal UU-P-31b	*ASTM*	*P.I.*	*TAPPI*
General				
Basis weight	110	D 646	T 3603	T 410
Brightness	111	D 985	T 3612	T 452
Gloss: 57.5°		D 1222	T 3611	T 424
75.0°		D 1223	T 3633	T 480
Odor				T 483
Opacity	151	D 589	T 3613	T 425
Paraffin		D 590	T 3631	T 405
Thickness and density	173	D 645	T 3604	T 411
Mechanical				
Abrasion, loss of			T 3628	T 476
Air resistance		D 726	T 3625	T 460
Bending quality			T 3619	T 474
Bursting strength	112	D 774	T 3606	T 403
Compression (Ring crush test)		D 1164	T 3618	T 472
Edge tearing resistance		D 827	T 3614	T 470
Flexural resistance, deflection			T 3617	T 469
Folding endurance	131, 132	D 643	T 3616	T 423
Heat test for relative stability		D 776		T 453
Internal tearing resistance	170	D 689	T 3607	T 414
Moldability		D 920	T 3627	T 446
Puncture, container board	—[2]		T 3635	T 803
Rigidity, stiffness, softness			T 3610	T 451
Stretch			T 3609	T 457
Tensile breaking strength (dry)	171	D 828	T 3608	T 404
Testing conditioning	102	D 685	T 3602	T 402
Wet tensile breaking strength	172	D 829	T 3615	T 456
Chemical and performance				
Asphalted, bleeding resistance			T 3630	T 475
Creasing of paper for WVP	120	D 1027	T 3624	T 465
Grease resistance (Turp. test)		D 722	T 3626	T 454
Insect resistance				T 473
Smoothness			T 3632	T 490
Water resistance of paper	181	D 779	T 3620	T 433
Water-vapor permeability	182	E 96		T 448
WVP of sheet material				
—at high temperature and humidity		E 96	T 3623	T 464
—at 0 deg. F.				T 482
Use characteristics				
Blocking resistance		D 918	T 3629	T 477
Flammability		D 777		T 461
Moisture content	240	D 644	T 3605	T 412

1 Many of these standard methods, originally prepared for paper and paperboard, are used, with appropriate modifications, for the testing of the same properties in plastic films, cellophanes and foils. Refer also to categories 2, 3 and 4.

2 There is a Federal standard for puncture but it is not part of UU-P-31b. It is listed as FED. 196-STD-101.

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2—Miscellaneous materials and components

	ASTM	P. I.
Adhesives		
Liquid, total solids content of	D 1489-90	T 3003
Bonding of labels	D 1581	
Closures		
Comparing, rating rubber closures		T 3203
Compatibility, rubber closures		T 3204
Measuring application and removal torque		T 3205
Screw cap liner—WVT in lining materials		T 3201
Screw cap liner—compatibility		T 3202
Films and foil (see also category 4)		
Accelerated aging	D 756	T 3404
Blocking	D 884	T 3405
Conditioning plastic films for testing		T 3401
Folding endurance[3]	D 643	T 3402
Internal tearing resistance[4]	D 689	T 3403
Plastic materials (specifications, tests)		
Cellulose acetate (compounds)	D 706	
Cellulose acetate sheet	D 786	
Styrene sheet, biaxially oriented	D 1463	
Polyethylene (compounds)	D 1248	
Printing		
Block point, flexible films		T 1005
Effect of alkali		T 1001
Dry rub resistance		T 1004
Fade-ometer		T 1002
Resistance to fats and oils		T 1003

3—Containers and packages

	ASTM	P. I.	TAPPI
Adhesiveness of seals, closures[5]			T 806
Compression test	D 642	T 3805	T 804
Conditioning paperboard, fibreboard	D 641	T 3801	
Cushioning materials	D 1372		
Dynamic properties	D 1596		
Drop test	D 775	T 3804	T 802
Drop test for bags	D 959		
Drop test (cylindrical)	D 997		
Drum test	D 782	T 3802	T 800
Flat crush of corrugated	D 1225		
Incline impact test	D 880	T 3803	T 801
Rigidity, stiffness: paper, board			T 489
Puncture, stiffness: paperboard, corrugated, solid fibre	D 781	T 3807	T 803
Static bending, corrugated	D 1098		
Vibration	D 999	T 3806	
Water resistance, spray method	D 951		T 805
WVP of packages	D 895		
WVP of shipping containers	D 1008		

3 See TAPPI test T 423m in category 1.
4 See TAPPI test T 414m in category 1.
5 FED. 101 UU-P-31.
6 Revision letters ("A," etc.) and amendment suffixes ("1," etc.) that commonly appear with specification numbers are not given here, for many of the standards are being revised or amended continually. The reader always should ask for the latest revisions and amendments in obtaining or using Government specifications or standards. Also, subject heading should be mentioned—such as "adhesive," "bag," etc.
7 For breakdown of tests in this title, see individual listings which appear in category 1, opposite page.

4—Federal and military specifications and standards[6]

Adhesives	
Methods of testing	FED-STD-175
Water-resistant, for sealing fibreboard boxes	MIL-A-101
Water-resistant, waterproof barrier material	MIL-A-140
Paper label, water-resistant	MIL-A-3941
Paper, wrapping, laminated and creped	MIL-P-130
Greaseproofed, flexible (waterproof)	MIL-B-121
Moderately water-vaporproof, interior packing bags	MIL-B-3959
Paper, wrapping, waterproofed, kraft	UU-P-271
Waterproofed, flexible, all-temperature	MIL-B-13239
Water-vaporproof, flexible	MIL-B-131
Bags	
Bags, interior packaging	MIL-B-117
Bags, transparent, flexible, heat sealable	MIL-B-22205
Envelopes, packaging, water-vaporproof, flexible	MIL-E-6060
Bags, textile, shipping, burlap, cotton laminated	PPP-B-35
Packaging, packing, overseas shipment: bags, sacks; textiles, paper (subsistance)	JAN-P-137
Sacks, shipping, paper	UU-S-48
Boxes	
Box fibreboard	PPP-B-636
Boxes, corrugated, triple-wall, 350-lb. max. wgt.	PPP-B-640
Boxes; paperboard, metal stayed	PPP-B-665
Cans	
Cans, metal, 28-gauge and lighter	PPP-C-96
Cartons	
Boxes, folding, paperboard	PPP-B-566
Boxes, set-up, paperboard	PPP-B-676
Paper	
General specifications, methods of testing[7]	UU-P-31
Paper, kraft, untreated, wrapping	UU-P-268
Paper, wrapping, chemically neutral	MIL-P-17667
Plastics	
Plastic, cellulose acetate, sheets and film	MIL-P-14118
Plastics (organic); general specification, tests	L-P-406
Polyethylene; molded, extruded shapes; sheets	MIL-P-22035
Polyethylene; molded, extruded shapes; tubing	MIL-P-26692
Sheet, polyvinylchloride, rigid	L-P-510
Sheet, vinyl copolymer, thin	MIL-P-6264
Films, flexible, vinyl chloride	L-P-375
Films, transparent, flexible, heat sealable	MIL-F-22191
Polyethylene, thin gauge (interim, Fed. Spec., Army QMC)	L-P-00378
Cellophane	
Coated, noncoated; regenerated cellulose	L-C-110
General	
Preservation, packaging, packing—tests	FED-STD-101
Methods	
Methods of preservation	MIL-P-116

LEGAL CONSIDERATIONS

Always a complex problem, the legal aspects of packaging demand increasing study because packaging itself is broadening and because there is an increase in regulatory activity, particularly the Food & Drug Amendment, the Textile Fiber Identification Act, and the new precautionary labeling law.

The consuming public assumes the manufacturer, packer or distributor has kept the consumer's health and welfare uppermost in his mind and expects a package and/or product to be free from contamination. Eye-appealing containers, packages and outer wrappings are almost a necessity on today's competitive market. However, the rules governing packaging and labeling should not be short-changed in favor of attractive packaging. Mislabeling, deceitful design, negligent packaging or adulteration can lead to financial penalties and serious legal consequences. And the resultant loss of consumer good will can cause irreparable damage. It is not impossible to combine mandatory information with good design. Proof of this exists on every shop shelf in the country.

On the opposite page, there is a checklist of the basic general requirements for the package which is legally acceptable.

The best procedure to follow when designing a package or container is to create one or two main or principal panels where the product name, net content designation, corporate information, required declarations and statements, etc., will appear in a prominent and conspicuous manner. This information must not be false or misleading and must not be obscured by designs, other words, statements, written, printed or graphic matter. Also, it must not appear in lettering so minute or illegible that it cannot readily be seen and read by the consumer.

There are many state laws controlling the size and style of the type in which this information is to appear. It it is the responsibility of the manufacturers, packers and distributors to make themselves aware of these existing regulations so as to avoid the loss of time and money arising out of noncompliance with regulations.

Before proceeding with the packaging and labeling of any product intended for interstate commerce, Federal Acts and regulations should be reviewed to assure compliance. (See table of agencies and products regulated, this page.) Moreover, if the reasonably anticipated use of any product involves potential hazard to the user, make it a rule to give it special consideration. For this is the basis on which the necessity of cautionary labeling or any type of special packaging must be decided.

As an example of the importance of attention to Federal regulations, three publications are cited by the Department of Agriculture as needed for full compliance with legal packaging of meat. Under the label control program of the Meat Inspection Division of the U. S. Dept. of Agriculture, contained in Section 5 of the Meat Inspection Act, it is mandatory that labels for domestic meat and meat food products be reviewed and approved before their use. Information about labeling and an explanation of the procedure for approval are in Agriculture Handbook 190, entitled "Meat and Labeling Program of the Meat Inspection Division, U. S. Dept of Agriculture." Additional information about labeling requirements appears in "Regulations Governing the Meat Inspection of the U. S. Dept. of Agriculture." This includes instructions about marking, branding and identifying products (Part 16), about labeling (Part 17), and about definitions and standards of identity (Part 28). Additional aid for legal compliance is found in Agriculture Information Bulletin 92, "The Inspection Stamp as a Guide to Wholesome Meat." All three booklets are obtainable from Supt. of Documents, U. S. Govt. Printing Office.

Other essential laws and regulations to be considered which pertain to the packaging, labeling, packing, shipping, selling, advertising, grading and standardization of products in general are those promulgated under

These Federal agencies[1] ↓ **regulate packaging and labeling of** →	*Food or soft drinks*	*Drugs & cosmetics*	*Chemical products*	*Alcoholic beverages*	*Other*
Federal Aviation Agency					X[2]
Dept. of Agriculture[3]	X	X	X		
Dept. of Health, Education & Welfare, Food & Drug Administration[4]	X	X	X	X	X
Dept. of the Treasury Alcohol and Tobacco Tax Div.				X	X[5]
Bureau of Customs	X	X	X	X	X
Coast Guard					X[2]
Federal Trade Commission[6]	X	X	X	X	X
Interstate Commerce Commission					X[2]
Post Office Dept.	X	X	X	X	X

1 Labels and wraps for poultry and meat products, alcoholic beverages, sea food under Federal inspection, and certifiable antibiotics and insulin must have prior approval from the proper Federal agency before they can be used. Labels and wraps for other products must conform to the appropriate laws. Public Health Service regulates manufacturing and distribution of toxins, serums and vaccines. Bureau of Narcotics regulates narcotics.
2 Jurisdiction over commodities, such as explosives, that are hazardous to transport.
3 Labeling of meat and meat products is regulated by the Agricultural Research Service of the department, Meat Inspection Division, under the Meat Inspection Act of 1906. Labeling of biological products for treatment of domestic animals is regulated by the Agriculture Research Service, Animal Inspection & Quarantine Division.
4 Regulates labeling of all foods (except meat and poultry products), drugs, drug devices, pharmaceuticals, cosmetics and pet food under the Federal Food, Drug & Cosmetic Act of 1938.
5 Regulates labeling of tobacco products; also packaging and labeling of non-beverage alcohol, denatured spirits and articles, including certain cosmetics, manufactured with denatured spirits.
6 Administers Wool Products Labeling Act of 1939, Fur Products Labeling Act, 1951, Textile Fiber Products Identification Act, 1959.

and administered by the various Federal agencies.

Another, and very important, source of information is the various trade and commercial associations: the manufacturing Chemists Assn., Chemical Specialties Mfrs. Assn., American Petroleum Institute, National Paint, Varnish & Lacquer Assn., National Agricultural Chemicals Assn., National Canners Assn., and The Toilet Goods Assn. (See also directory of associations at back of this book.)

Protection of designs

With the development of a new package, packaging method, package design or trademark considered to be original, novel and of commercial value, the need arises for proper protection of the creation. Three types of coverage are available: (1) patent, (2) copyright or (3) trademark registration. Each procedure differs with respect to the type of material covered and the time spent in submission of the application. And each, for its category, carries the best protection available against plagiarism.

To avoid the complications of an infringement claim, a search should be made in the U. S. Patent Office to determine the availability of a trademark or the possible existence of a prior patent.

Copyright. The copyright is protection for the text and/or illustration on a package. A copyright registration is granted without a search, but to be entitled to copyright protection a work must contain something capable of being copyrighted—that is, an appreciable amount of original text or pictorial material.

The new and original package and label must bear the copyright notice consisting of the word "Copyright" or the abbreviation "Copr." followed by the name of the individual or organization seeking the registration. A permissible alternative is the symbol © followed by the name or initials of the individual or organization. If initials are used, the complete name of such individual or organization must also be printed somewhere on the package. The year of publication may be included in the copyright notice, but this is not mandatory.

The package bearing the copyright notice must then be entered into commerce or "published." Application forms may be obtained without charge from the Register of Copyrights, Library of Congress, and after proper

Checklist of requirements for legally acceptable packages*

A. Design and construction

1. Have deceptive designs or constructions (i. e. false bottoms, hollow dividers, fillers, side walls, lids or covers) been avoided?
2. Is that portion of package or wrapper which is in contact with food, drugs or cosmetics free of any harmful substance which could be a hazard to public health?
3. Does the food package or wrapper contain any substance that may be absorbed by the contents and thereby require clearance as a food additive?

B. Product name

1. Does product name (usual or common name as set forth in the United States Pharmacopoeia[1] and/or other official compendium or in Government Standards of Identity[2]) appear completely and legibly, and is it accurately descriptive of product?
   a. If no standardized name applies and if product is not an imitation of a standardized product, does devised or coined name accurately describe product?
   b. Have all words in product name which are geographically or descriptively misleading as to origin or type of product been avoided?
   c. Do all words comprising product name appear in lettering of same size, style, type and color, on the same background and with equal prominence—thus avoiding misleading impressions?

C. Necessary declarations

1. Do optional ingredients as required by Standards of Identity, etc., appear?
2. Do manufacturer's name and address, as required or permitted by F&DA, Meat Inspection Act and Poultry Products Inspection Act, appear?
3. Does word "imitation" appear where applicable and where allowed?
4. If a drug, is there a complete listing of the ingredients that constitute a nonstandardized product? If a drug, is there a complete listing of active ingredients? Are the ingredients listed in order of prominence by weight and by their common or usual name? Are all ambiguous or obscure abbreviations eliminated? Do statements of the presence of artificial coloring, artificial flavoring or chemical preservatives appear? And has proper clearance been obtained for legal use?
5. Do the name, quality, kind and proportion of certain drugs appear on package or label together with information as to whether drug is a derivative of another drug and whether it is active or inactive?
6. Where applicable, do adequate directions and necessary warnings appear?
7. If warning labels are used, are they really necessary? (The use of warning labels on relatively harmless products or the use of unnecessary wordings promotes a disregard of these labels and defeats their purpose.)
8. In the case of a package containing poison, does word "Poison" appear in specified type and does an "antidote" statement appear?[3]
9. If article is an antibiotic, insulin or certified color, does label conform with regulations that apply?
10. If the article is a new drug, has a new-drug application become effective and does the package bear the labeling, including warnings, indications, etc., for the drug—or if the article is a new drug for experimental use, does it bear labeling as required by the regulations pertaining to drugs for experimental use?
11. If the article is subject to deterioration, does the label bear a statement of precautions necessary to prevent or retard deterioration and an expiration date necessary for the protection of public health?

D. Contents

1. Is quantity of contents within container declared in terms of weight (avoirdupois pounds and ounces); liquid measure (gallon, quart, pint and fluid ounce); dry measure (barrel, bushel, peck, dry quart and dry pint); numerical count—whatever the case may be or a combination of these, according to custom in the industry concerned?
2. Is declaration expressed in the number of the largest unit? (For example: a package containing 32 oz. must declare contents as 2 lbs. rather than 32 oz.)
3. Is quantity declaration the minimum or average net weight—since reasonable tolerances are permitted under the average, but no shortages are permitted under a minimum weight declaration.
   a. Have governing regulations for tolerances and exemptions been thoroughly investigated to determine whether they apply specifically to product being packaged and labeled?
   b. Allowable tolerances are: (1) bulk shipments, (2) packages holding ½ fluid or avoirdupois oz. or less and (3) packages containing less than six units which are easily seen and counted through outer transparent wrapping. *Assumptions as to tolerances and exceptions allowed should not be hazarded.*

*A checklist such as this cannot pretend to completeness. In all cases where doubt may arise, the various agencies and acts that apply should be consulted. See table "Federal Agencies Regulating Packaging and Labeling," opposite page. For more complex questions, competent legal advice should be sought.
1Published by the United States Pharmacopoeia, New York.
2Definitions and standards under the Federal Food, Drug & Cosmetic Act and the Federal Alcohol Administration Act.
3Federal Hazardous Substances Labeling Act.

More Than Skin-Deep

Packaging for impulse sales is mighty important, but packaging for *repeat* sales is no less so. Snell services help create packages which win lasting friends for their contents.

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Development and testing of packaging materials
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Physical design and evaluation
— engineering of the package and packaging equipment.

Food packages
— analysis for migrants, assistance in petitioning FDA for clearance, toxicology, sensory panel studies.

Evaluation
— shelf-life studies, accelerated aging, physical testing, etc.

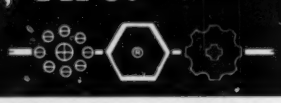
Developments by Snell include aerosol shaving cream, aerosol shoe-polish, non rigid vacuum packs for cheese, cold-cuts, etc. Tests conducted on can-linings, plastics, foil for food use. Sensory panel studies of cigarette, candy packages. Trouble shooting on adhesives, aerosol valves, etc.

Your inquiries will be promptly answered.

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execution may be submitted together with the necessary fee and two complete and legible specimens of the package or label.

The copyright remains in effect for 28 years and is renewable one year before date of expiration for an additional 28-year period.

Foreign copyrights may be secured in many countries, under the Universal Copyright Convention treaty, by publishing the print or label as described previously for domestic copyright. Form UCC1 and Annex A, obtainable from the Copyright Office of The Library of Congress, give details and a list of countries in the treaty.

Trademark. The trademark is defined in the Trademark Act of 1946 as any word, name, symbol or device or any combination of these adopted and used by a manufacturer or merchant to identify his goods and distinguish them from those manufactured or sold by others.

The do's and don'ts surrounding the registration of trade names and trademarks are extensive. General information, laws and rules pertaining to trademarks may be obtained in pamphlet form from the Supt. of Documents, U. S. Government Printing Office, Washington 25, D. C. A good knowledge of these general rules in the beginning can avoid possible future complications and considerable inconvenience.

However, occasionally a trademark by its very nature may be refused registration. Some of the grounds for refusal are:

1. It resembles a trademark already registered or used by someone in the United States who can claim exclusive rights through long years of use.

2. It comprises the flag or coat of arms or other insignia of the United States, its territories, any state, municipality, foreign nation or particular organization, such as the Red Cross, the Boy Scouts of America or the American Medical Assn.

3. It consists of a name, portrait or signature of a living person and written consent has not been given for its use.

4. It is a surname, description or misdescription of the goods covered.

5. It is a geographical description or misdescription of the goods which is deceptive.

However, referring to paragraphs 4 and 5, the Commissioner may grant registration to any trademark upon

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prima facie evidence that the mark has become distinctive as applied to the applicant's goods in commerce by its substantially exclusive and continuous use by the applicant in commerce for 5 years preceding date of filing of the application for its registration.

After the newly created trademark has been used in interstate commerce, application for trademark registration may be submitted. This application must be in written form, as prescribed by the Commissioner of Patents, and signed and sworn to by the applicant. It is then submitted to the Patent Office, together with the filing fee, a drawing of the mark and five specimens on which the mark appears. In the event the application is based on a prior foreign registration, a certified copy of the foreign registration must also be submitted.

When a trademark registration is granted, registration notice, "Registered in U. S. Patent Office," "Reg., U. S. Pat. Off." or the registration symbol ® should be shown in close proximity to the registered trademark. It is important that one of these notices accompany the mark wherever it is displayed. If there is no marking, the trademark owner cannot recover damages in a suit for infringement unless the defendent had actual notice of the infringement.

Discontinued use of a registered trademark for a period of two years can create a presumption of abandonment which could lead to the eventual cancellation of the trademark.

Caution should be exercised also with regard to the use of a registered trademark in descriptive matter and advertising. Through improper use, a mark can dissolve into a generic word or common descriptive name which then makes it public property or puts it into the public domain. To preclude such an occurrence, notice of U. S. Patent Office registration should be included whenever the mark is used.

A trademark remains in effect for 20 years. It is renewable six months before the date of expiration. An affidavit of use must be filed after the product has been in use for five years.

Patent. A patent is protection for the package construction or packaging process. After an invention for a new one has been perfected, a patent application should be filed at the earliest possible date. In the event this protection is desired after the new package or packaging method has been in commercial use, patent application

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Strip packaging	Bundling
Blister packaging	Packaging
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Bag forming	Labelling
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LOOKING FOR . . .

Materials: Adhesives? Films? Foils? Papers? Tapes?

Containers: Aerosols? Bags? Blister packs? Bottles? Cans? Cartons? Crates? Drums?

Machinery: Cappers and sealers? Case sealers? Counting machines? Fillers? Heat sealers? Heat shrink equipment? Labelers?

Services: Contract packaging? Custom laminating? Decorating and custom finishing? Engineering consultation? Package designing?

An Alphabetical List of Suppliers to the packaging field—accurate, up-to-date, complete with addresses?

YOU'LL FIND THEM IN

the Directory Section of this 1962 MODERN PACKAGING ENCYCLOPEDIA ISSUE. And—be sure to check the *advertisements* of the companies whose products or services you're investigating.

MODERN PACKAGING ENCYCLOPEDIA ISSUE

A BRESKIN PUBLICATION

must be filed prior to the lapse of one year of use.

The patent application must be in written form, signed and sworn to by the inventor, and must include a complete description of the package construction or packaging process and claims defining the invention. When in proper form, the application—accompanied by a drawing of the invention (if it can be illustrated), an oath, power of attorney, petition form and the filing fee—should be forwarded to the U. S. Patent Office for examination. The detailed procedure embracing the form for filing a patent application requires the expert knowledge of a patent attorney.

Although notices of patent protection are not mandatory, it is good practice to make known to the public the fact that a patent has been applied for or issued so that, in the event of an infringement suit, damages may be recovered without having given the infringer actual notice.

Pamphlets containing general information concerning patents may be obtained from the Commissioner of Patents.[1] Obtaining protection in foreign countries for valuable package designs, packaging methods and trademarks is important. Since foreign protection laws differ widely, it is best to seek an attorney specializing in foreign patent practices before filing in other countries.

Once the legal requirements for a package have been established, it is necessary to translate them into procedure and guard against practices which could involve legal penalties.

The well-equipped and well-maintained packaging line supplied with uniform, quality materials and operated to meet high standards is a line properly conceived to turn out safe packages.

The package that protects the product and identifies it clearly and quickly will find few if any conflicts between effective sales requirements and safe legal requirements. Proof of this is the numerous statutes that not only are supported by leading firms, entire industries or trade groups, but which may have been initiated and sponsored for enactment by them.

Shipping regulations. For a guide to compliance with the legal aspects of shipping, refer to the table "Sources of Shipping Regulations" on p. 702.

1 "Answers to Questions Frequently Asked about Patents," available from the U.S. Department of Commerce.


Du Pont Alathon® for Packaging Applications

ALATHON® POLYETHYLENE RESINS

The demand for packaging products that employ polyethylene-coated substrates continues to rise sharply. Today various coatings of Du Pont ALATHON® polyethylene resins are finding extensive applications on pouch stock, kraft, fabric, foodboard, cup stock, boxboard, foil and many types of film.

In the pre-packaged food field particularly, these extrusion-coated substrates are making broad gains. Bakery board, frozen meat trays, frozen food cartons, heat and serve packages and single-service milk cartons are high on the list of polyethylene-coated items.

Coatings of ALATHON offer outstanding protective qualities. The water vapor transmission rate is extremely low. Thus, if the problem is keeping moisture out, such as in hygroscopic food products, or keeping moisture in, as in liquid products and baked goods, ALATHON serves extremely well.

Even though coatings of ALATHON are frequently light in weight, they offer increased toughness and strength to the over-all package. Coatings of ALATHON have high resistance to puncture and low notch sensitivity. ALATHON is inert to food acids, chemicals and most solvents. It is odorless, tasteless and non-toxic.

Coatings of ALATHON add properties to the substrate which otherwise would be difficult or impossible to attain. For example, ALATHON provides strong, long-lasting heat seals which many packages require, yet are not available with only the substrate. The combination of ALATHON and a particular rigid or flexible material often results in benefits not possible with either material alone.

The advantages of coatings of ALATHON can now be enjoyed to a wider extent than before because of the recent development of processes to make polyethylene coatings gluable and printable. Accomplished during the extrusion coating operation, the result is a high gloss coating, possessing the desirable functional properties of ALATHON, which can be printed by standard printing processes. Full color photographs or delicate line work can be faithfully reproduced. And the coating also permits the use of standard gluing machinery.

By varying the molecular structure Du Pont has developed polyethylene resins which excel in particular areas. You may now select from the widest range of coating resins on the market. Therefore, you can specify with confidence the one coating-resin of ALATHON that best fits your particular packaging need. Check with your supplier for more complete information, or write to Du Pont.

① Modern milk containers coated inside and out with ALATHON reduce the problem of leakage. The odorless, tasteless, non-toxic coating of ALATHON can't flake off and float in the milk. ② A tough coating of ALATHON gives this package of MYLAR® polyester film superior resistance to moisture transmission through pinholes. ALATHON provides easy heat sealing for this attractive package. ③ This new fertilizer package derives two main advantages from its coating of ALATHON. It can be glued with low-cost starch adhesives at box board speeds. And the coating adds excellent moisture resistance.

SIS FOR PACKAGING APPLICATIONS

extrusion coating







ALATHON® POLYETHYLENE RESINS





SIS FOR PACKAGING APPLICATIONS

molding



Du Pont ALATHON® polyethylene resins are available in a wide range of low, medium and high density grades. This broad range of resins is particularly important in the rapidly growing market for molded containers—bounded by rigid bottles at one extreme and flexible tubes or squeeze bottles on the other.

Closures molded of ALATHON offer a wide variety of forms and properties. There are screw-on or snap-on closures, complex action type dispensers, flip-top closures and even free-flowing closures with spouts and removable diaphragms. Properly designed closures of polyethylene eliminate the need for liners in most cases.

By the selection of the proper ALATHON resin, the gloss, snapback, stiffness and crack resistance of the finished item can be varied to meet your needs. Whatever their size or shape, containers formed of ALATHON are chemically inert, tough and lightweight. They are unaffected by refrigeration and are tasteless. Frequently thin container walls can be used with resulting economies in material costs. And the savings on breakage and reduced shipping weights can be substantial.

With merchandising based so heavily on package design, the family of Du Pont ALATHON polyethylene resins, with its wide variety of properties, is suited to an increasing number of applications. Consult your supplier on how you can take advantage of these properties.

(1) Shoe polish container and inner cap molded of ALATHON are light in weight, colorful and warm to the touch. Container has excellent snap-back qualities, is tough, unbreakable and chemically resistant. (2) Dispenser closures molded of ALATHON provide high speed assembly, insure sealability and deter cap removal or tampering. ALATHON is used for its ability to hold dimensional tolerances and elasticity needed for a snug fit. (3) Bleach bottles molded of ALATHON are unbreakable, safe and easy to handle. They have the required chemical resistance plus the necessary rigidity.

ALATHON® POLYETHYLENE RESINS

film and sheeting



The fast-growing use of polyethylene films and sheeting stems from their adaptability to the packaging needs of many diverse products. Du Pont has developed a complete family of ALATHON® polyethylene resins—of varying densities—for unsupported film and sheeting applications.

Certain ALATHON resins are designed to produce films with high transparency and unusual gloss. Other formulations form extremely tough and durable film and sheeting. Still others can be made to be shrinkable, with more or less stiffness, better impermeability or additional crispness.

Films made of ALATHON offer a pleasing hand, flexibility at high or low temperatures. There's no problem with shelf life —ALATHON will not embrittle or deteriorate with age—contains no plasticizers. And ALATHON has an extremely low water transmission rate, heat seals efficiently, quickly, and permanently on high-speed equipment and can be easily and attractively printed.

Thickness for thickness, today's polyethylene film is the least expensive transparent packaging film on the market. Small wonder film and sheeting of Du Pont ALATHON are finding a greatly increasing number of uses. Consult your supplier to find out which of the many resins of ALATHON available will best solve your packaging problem.

① "Pour and Store" bags of ALATHON are easy to seal, flexible at freezing temperatures and easily printable. Polyethylene film is tough, clear and economical.

SES FOR PACKAGING APPLICATIONS

	ALATHON	MELT INDEX	DENSITY	PROPERTIES & APPLICATIONS
film resins	1410	1.9	0.915	Unusually tough and flexible. Widely used as industrial film, including drum linings and hardware packaging. Other versions of this resin are available with different melt index and additive levels.
	2312	3.2	0.9215	Outstanding optical properties; for general purpose packaging of soft goods and lighter produce.
	3100	4.0	—	Combines toughness with sparkling clarity; recommended for general packaging applications.
	3420	4.0	0.917	Industrial black film. Good tear strength, flex life and outdoor weatherability.
	4460	4.5	0.930*	A medium density resin especially designed for production of overwrap and breadwrap film by the flat die process.
extrusion coating resins	15	4.0	0.917	General purpose coating resin. Heat seals at low temperature. Gives very low neck-in.
	1550	9.0	0.917	Excellent drawdown, adhesion, and heat sealability. Recommended for light weight, high speed coatings.
	16	3.7	0.923	Outstanding general purpose coating resin, excellent draw rate, processibility, and adhesion.
	34	3.0	0.930	Combines good processing characteristics with excellent barrier properties.
	4350	7.0	0.930	A medium density resin with outstanding processibility. Combines high drawability with low neck-in and good adhesion.
molding resins	10	2.2	0.922	Two general purpose resins with outstanding toughness. Recommended for containers, lids, and closures.
	14	1.9	0.915	
	17	22.0	0.926	Two resins in the intermediate density range with excellent processibility, short cycle time and high surface gloss.
	37	12.0	0.930	
	18	23.0	0.915	Exceptional flexibility and freedom from warpage.
	20	1.9	0.920	Two resins with outstanding resistance to environmental stress-cracking. Recommended for bottles, tubes and closures and molded containers.
	22	3.0	0.921	
	7030	3.0	0.955	High density molding resins. Applications offer low molded-in stress for minimum warpage and greater toughness.
	7040	6.0	0.957	
	7050	15.0	0.957	
	7500	1.5	0.960	Stiff, easily processed high density blow molding resins. Recommended for bottles, tubes and general purpose blow molding.
	7511	0.3	0.960	

***Base Resin Density.** In addition to this basic line of packaging resins, there are a number of special formulations involving minor variations in melt index, and in slip and anti-block formulations. For further details, consult the Du Pont District Office nearest you—see list on the back of this page.



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CONTRACT PACKAGING

by Arthur J. Frey*

During the past twenty years, contract packaging or, as it is sometimes known, custom packaging or private label packaging, has come of age.

With some notable exceptions, contract packaging prior to World War II consisted of a few small companies with limited equipment and space, using the open time on their equipment to package limited quantities of materials for their customers. Today a single contract for a major marketer may involve production of 10 million units of a nationally known product and represent an annual value at retail of $10 million or higher.

Marketers usually do not wish to emphasize the fact that their packaging is customized. Indeed, little or no purpose would be served by doing so. Consequently, the true merits of custom packaging tend to remain unpublicized and unrecognized. However, contract packagers handle part or all of the production of numerous national brands of household and laundry chemicals, including detergents; automotive specialties, including antifreeze; various pharmaceuticals and certain food products.

Several custom packagers have been serving the same major accounts continuously for 20 years or longer. Some of these individual accounts or billings (materials and services) run up to $1 million a year or higher. Accurate estimates are difficult to establish, but perhaps 60% of all aerosols and a substantial but far lesser proportion of various chemical specialties and pharmaceutical items are custom packaged. Contract packaging over-all is producing probably upwards of $100 million worth of packaging and services a year. As such it is a large consumer of materials and equipment.

Because contract packagers customarily get the new product, the hard-to-find product and a continual variety of packaging operations, they have long been recognized as innovators as well as skilled and experienced package planners. Much of their equipment is specially developed. Some models have proved so important and unique that they have found their way into the packaging field as standard models sold or licensed by established packaging machinery manufacturers or distributors.

The use of contract packaging is not universally applicable nor would any contract packager recommend it as such. However, when the subject is carefully and intelligently studied by the marketer and when the custom packager is chosen with the same diligence that a firm should use in selecting any prime source for supplies or services, then a basis for packaging success and mutual profitability usually can be anticipated. The careful specification in writing for all arrangements is even more imperative in contract packaging than in many less-exacting lines of commercial activity.

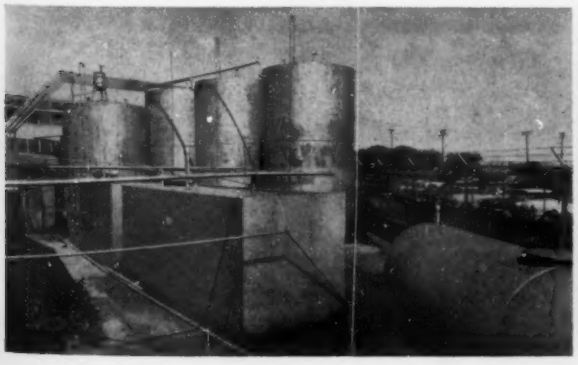
Marketers who have worked successfully with contract packagers accept them as trusted partners, and long-term mutual gains are often the result of the relationship.

Why contract?

Contract packaging received its greatest impetus following World War II due to rapidly increasing labor rates, transportation charges and building costs. Let's take the example of the major oil company which had a line of automotive chemical specialty products they were producing in one of their warehouses with rather antiquated packaging equipment and the use of warehouse personnel. The sale of specialty items was, of course, not a major portion of the oil company's total sales, yet represented sufficient business to warrant the continuation of the line of automotive chemical specialties. When a cost study was finally made, assigning proper costs as they related to space, labor and overhead, it was found that rather than realizing any profit from such an operation it was actually costing money. A contract was negotiated with a contract packager who had the necessary packaging machinery for the efficient production of the needed packages, whose labor rates were considerably lower, and who had the space for the efficient handling and shipping of the finished product. The result was a uniform fixed cost for each item; thus a loss operation was

*Vice President in Charge of Sales, Products Packaging, Inc., Cleveland, O.

BULK STORAGE tanks for liquids. Customer's materials are stored here. Other tanks are underground to comply with local regulations. *(Products Packaging photo)*



LABORATORY is for quality control work of finished and raw materials, other developments. Chemists make microscopic examinations, weighings, running titrations. *(Kolar Lab. photo)*



NTED IN U.S.A.

turned into a profitable one—good for both oil company and packager.

The advent of the aerosol, perhaps more than any other single factor, pointed up the advantages of contract packaging. When aerosol packages were introduced and found immediate acceptance with the public, more and more marketers looked to pressurized packaging for their products. These marketers immediately found that the aerosol package required considerably more know-how, machinery and equipment than was required for the rather simple process of putting a product into a bottle or a can. A few far-sighted individuals installed aerosol packaging equipment and went about soliciting the packaging of a wide variety of products in aerosol packages. The economics were immediately visible, of course, since in that time even a modest aerosol packaging line represented a substantial capital investment and, without know-how, this was of little value. The aerosol contract packager thus contributed an essential service to the marketer with a product to go into an aerosol package—no investment in personnel, equipment or space was required on the part of the marketer. Today the evidence is amply clear that the aerosol contract packager filled a real need faced by those early marketers of products packaged in aerosols, and this has remained true for the multitude of aerosols that followed.

Other factors contributing to the growth of contract packaging relate to the marketer with a seasonal product. This marketer was and is able to take advantage of the existing high-speed packaging facilities of the contract packager to meet his peak seasonal requirements. He is spared a substantial capital investment in facilities that would be used only a comparatively short time each year and then stand idle, occupying space and of course showing no return on capital investment. Insecticides, agricultural and lawn-care products, windshield de-icers and ice melters are a few examples of seasonal products able to take full advantage of the contract packager's service.

To the national marketer, manufacturing and distributing from a single location (and contemplating the ever-increasing costs of transportation), the contract packager offers a welcome service. Let's again take the extreme example of the national marketer located in the Far West. To get his product to the Middle-West and the East, it was necessary to ship carload or truckload to a warehouse—not only to service his accounts efficiently but also to combat the higher costs of distribution for less than car or truck shipments.

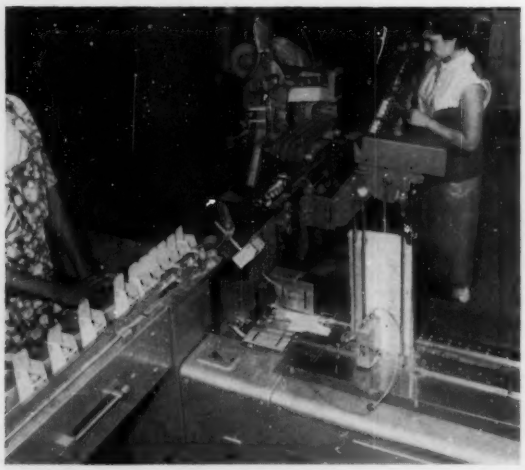
The marketer studied contract packaging. He found he could have his products packaged in Dallas, Atlanta, Chicago, Cleveland and in Camden, N. J., and thus—without any investment on his part—have a branch plant for packaging in the very heart of his largest marketing areas.

This marketer enjoyed a fixed per-unit packaging cost, a substantial saving in his cost of distribution, and at the same time provided better and quicker service to his customers. Also he had multiple sources to help cushion the effects of fires, strikes or similar problems, should they ever occur.

In the United States there are perhaps 160 recognized contract packagers packaging chemical specialties, drugs and personal products, food, notions, hardware, toys and industrial products in bottles and cans, aerosols, boxes, cartons, flexible packages, tubes, capsules, blisters and skin packs. Most contract packers do not package all the aforementioned products nor do they package in all the aforementioned containers. Many of them specialize in certain categories such as food packaging, chemical specialties or military and export packaging. Opposite is a special chart, Guide to Contract Packaging Services, broken down by geographic location, by types of products handled and by types of containers. This chart will help you find the right packager.

Contract packaging is a respected and necessary segment of the packaging industry, providing a wide range of high-speed equipment for the packaging and often the manufacturing of products. And, these facilities are backed up by skilled personnel with packaging know-how and a laboratory with adequate staff for product development and quality control, with space necessary for the proper handling of materials and truck docks and rail sidings for the proper distribution of finished goods. Often the contract packager will help in package development, procurement, formulation, packaging, drop shipment and billing.

TABLET LINE. Sixty units a minute inserted in cartons after bottles are fed automatically to conveyor from machine with wraparound labeler attachment. One operator supervises. *(Packaging Corp. of America photo)*



INDIVIDUAL-portion packaging service—jellies, condiments, etc., in square plastic packs, round rigid cups with caps, squeeze-type packets. Labels and copy imprinted. Sugar, salt, pepper supplied in polyethylene-lined packets, imprinted. *(Package Consultants photo)*



Guide to Contract Packaging Services

COMPANIES	TYPES OF PACKAGING					
	Foods	Drugs, Personal Items	Notions, Hardware, Toys	Chemical Specialties	Industrial & Shipping	W-Wraps P-Pouch
EAST						
Commerce Packaging Corp., Stamford, Conn.			●		●	W & P
Guard All Chemical Co., Inc., So. Norwalk, Conn.		●	●	●	●	
Manufacturers Box Co., Inc., Bridgeport, Conn.	●	●	●	●		
Pace Incorporated, Wilmington, Del.		●		●		
Packaging Services Inc., Wilmington, Del.	●	●	●	●		P
Fuld Brothers, Inc., Baltimore, Md.				●		
Brockton Contract Packaging, Brockton, Mass.	●	●		●		W & P
Pioneer Folding Box, Inc., Chicopee, Mass.		●	●			
Puritan Aerosol Corp., Boston, Mass.	●	●		●		
Shield Chemical Co., Hyde Park, Mass.		●		●		
Tubed Chemicals Corp., Easthampton, Mass.	●	●	●	●		P
Unit-Packet Corp., Wilmington, Mass.	●					P
Bock Enterprises, Inc., Newark, N.J.	●	●	●	●		
Custom Packaging, Inc., Newark, N.J.	●	●	●			W & P
Henry K. Davies & Co., Inc., Glen Rock, N.J.				●		
Dumont, Inc., Englewood, N.J.	●	●	●	●		W & P
Dyn Corp., Cliffside Park, N.J.	●	●	●	●	●	W & P
Fluid Chemical Co., Inc., Newark, N.J.	●	●		●	●	W
Ivers-Lee Co., Newark, N.J.	●	●	●	●		W & P
The Karp Co., Jersey City, N.J.	●		●		●	W
Lawson Packaging Corp., Englewood, N.J.		●	●	●		W & P
Martex Co., Inc., Vineland, N.J.		●	●	●	●	●
Mason-Keller Corp., Roseland, N.J.	●	●		●		P
Monroe-Danford & Co., Weehawken, N.J.		●	●	●		P
Park Packaging Co., New Brunswick, N.J.		●	●	●		P
Preservation Packaging, Inc., Hillside, N.J.			●		●	W & P
Private Brands Co., Bloomfield, N.J.	●	●	●	●		W & P
Unette Corp., Livingston, N.J.		●		●		
A-M-R Chemical Co., Inc., Brooklyn, N.Y.		●		●		W & P
AP Applicator Co., Pleasantville, N.Y.				●		
Associated Brands, Inc., Brooklyn, N.Y.	●	●		●		
Bard Pharmaceuticals, Inc., Yonkers, N.Y.		●			●	
Beacon Packing Corp., Brooklyn, N.Y.	●	●		●		W & P
Brownie Mfg. Co., New York, N. Y.			●	●		P
Carbona Products Co., Long Island City, N.Y.			●	●	●	
The Edlaw Packaging Co., Inc., Glendale, N.Y.	●	●	●	●		P
Gotham Plastics Co., Inc., Bronx, N.Y.			●		●	P
Gregory Packaging, Inc., New York, N.Y.	●					●
Impact Container Corp., Alden, N.Y.	●	●		●	●	
"J" Chemical Works, New York, N.Y.				●		
Kolmar Laboratories, Inc., Port Jervis, N.Y.		●		●		
Lee Packaging Laboratories, Inc., Brooklyn, N.Y.		●	●	●		W & P
Leedpak, Inc., New York, N.Y.	●	●	●	●	●	W & P
Andrew M. Martin Co., Ossining, N.Y.	●	●		●		P
Marvell Pharmacal Co., New York, N.Y.		●		●	●	P
Package Consultants, Inc., Brooklyn, N.Y.	●	●		●		P
Regal Chemical Corp., Brooklyn, N.Y.		●		●		
Sager Bros., New York, N.Y.		●	●	●		
Sonorol Laboratories, New York, N.Y.		●		●		
Sprepak Chemicals, Inc., Brooklyn, N.Y.		●	●	●		
Talmalin Mfg. Co., New York, N.Y.						P
Trefolex, Inc., New York, N.Y.	●	●		●		
Visual Packaging Co., Inc., Brooklyn, N.Y.		●	●			●
The Vitarine Co., Inc., New York, N.Y.		●		●	●	
Automatic Packaging Co., Inc., Philadelphia, Pa.	●	●	●	●		P
C. P. Baker & Co., Philadelphia, Pa.		●		●		
Contour Packaging Co., Philadelphia, Pa.	●	●	●			
Contract Packaging Corp., W. Conshohocken, Pa.			●		●	P
Crawford Industries, Inc., Oil City, Pa.				●	●	
Krylon, Inc., Norristown, Pa.	●	●		●	●	●
Bert Long Contract Packers, Lancaster, Pa.	●	●	●	●	●	P
Walter P. Miller Co., Inc., Philadelphia, Pa.		●				●
Newell Div., Clinch-Tite Corp., Sandy Lake, Pa.					●	
Pittsburgh-Penn Oil Co., Pittsburgh, Pa.				●		
Pressure Products Co., West Chester, Pa.		●		●		
Seaboard Mfg. Laborstories, Philadelphia, Pa.			●	●	●	W & P
Windsor Chemical Laboratories, Philadelphia, Pa.		●	●	●	●	
Packaging and Converting Co., Washington, D.C.					●	

See continuation →

The information in this chart is based on replies to a questionnaire submitted to contract packagers. Neither completeness nor endorsement is implied. See also listings for contract packagers, aerosol loaders, thermoformers and similar activities in the services section of the Buyers' Directory at the back of this issue.

[1]Most packagers offer a number of services. Contract packagers were asked to give only their principal activities for this listing. The reader is advised to consult individual firms for complete information in regard to services and facilities available.

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GING		CONTAINERS HANDLED							SPECIALTIES[1]
Industrial & Shipping	W=Wraps P=Pouches	Boxes, Cartons	Cans, Bottles	Aerosols	Collapsible Tubes	Capsules	B=Blister S=Skin Packs		
	W & P	●	●				B & S		Military, commercial, export, ball bearing, blister and canning.
		●	●		●				Custom packaging all size lots. Full range collapsible tubes; can, bottle filling. Formulating to shipping.
		●					B & S		Folding, merchandising displays. Fancy set-up boxes.
		●	●	●					Aerosols — private labels; fluorinated, inert propellants. Short and long runs. Explosionproof plant.
	P	●							Unit packaging liquids, powders, hardware. Vacuum packaging. Water-soluble film unit packages.
		●	●	●					Aerosols: sanitary maintenance products. (Similar plant in Los Angeles, Calif.)
	W & P	●							Flexible packaging of powders, granules, flakes, liquids by wt., vol., ct. Liquid-impregnated pads. Casep
		●					B		Contract packaging of cosmetics, hardware, novelties.
		●	●	●					Develop, compound and fill all types of aerosols in cans, glass, plastic containers. Large research facili
				●					Complete aerosol formulation and packaging facilities.
	P	●	●		●	●	B & S		Wide range of products and containers handled. Strip packaging. Special food area. Separate plant for flam
	P								Unitized portions — liquids, granulars, tablets. Rigid and semirigid products (flexible overwraps).
		●	●				B & S		No minimum production; pilot runs; sample work; complete packaging facilities.
	W & P	●	●		●				Liquids and powders in packets. Samples of all descriptions. Complete facilities: formulating to shipping.
			●		●				Metal and plastic tubes; liquids, greases, creams.
	W & P	●	●		●				Food products, candy, pharmaceuticals; nitrogen packaging; detergents, military packaging. Self-mailers.
	W & P	●	●		●	●	B & S		Contract assembling, collating, filling, unit packaging, pasting, gluing, heat sealing, shipping, storing.
	W	●	●	●	●				Complete facilities: formulating to shipping. Plastic tube filling.
	W & P	●			●				Flexible unit packaging solids, powders, liquids and 3D. Duplicate facilities in Canada.
	W	●							Cellophane bags; overwrap trays; export packaging of foods.
	W & P	●					B & S		Automatic equipment, flexible and strip applications. Thermoformed blister packaging. Premiums, assembl
	●	●	●						Large and small items. Domestic and military. Drop shipments.
	P	●				●	B		Three-dimensional unit packages for single service use: foods, drugs, cosmetics.
	P		●				B & S		Complete facilities to handle and pack corrosive and flammable materials.
	P	●	●				●		No minimum production; pilot work, sample work, promotions, displays, mailing and shipping.
	W & P	●					B & S		Development of design of protective packaging. High-speed equipment for hardware items. Military packag
	W & P	●	●		●	●	B & S		Handle any clean, nontoxic product. Formulating and/or packaging operations of a repetitive nature.
					P	P			Unit dispensers in saran plastic with tear, rupturable or solid seals or cotton applicator tips.
	W & P	●	●	●	●				Complete aerosol facilities, liquid and powder filling. Special facilities for storing and filling of flammabl
		●	●						Bottle, cap, label, pack and ship. Touch-up enamel in small and medium quantities.
		●	●	●	●				Aerosols and conventional packaging of bottles, tubes, jars under one roof.
		●	●		●	●			Product development, manufacturing, quality control. Tablets, capsules, liquids, powders, ointments.
	W & P		●						Complete facilities: manufacture, process, package. Any nontoxic item. High-speed glass and can lines.
	P								Packaging of small, dry products in heat-sealed packages of cellophane, etc., up to 5 in. by 5 in.
		●	●		●				Compound and fill still, foaming and semi-liquids.
	P	●	●						Versatile equipment, complete engineering facilities for products requiring special handling. Long or test
	P	●					●		Assembly, fabricating, finishing, packing. Hand and automatic.
	●	●							All types of frozen foods and foods in powder form.
			●	●					16- to 45-oz. aluminum aerosols. Any product, propellant or blends. Complete laboratory available.
		●							Industrial cleaning compounds; dishwashing compounds.
		●	●	●	●				Cosmetics and allied products.(Similar plants in Milwaukee, Wis., and Los Angeles, Calif.)
	W & P					●	B & S		Blister and skin packaging; strip, unit, bag and pouch packaging.
	W & P	●	●		●		B & S		Form, fill plastic bottles. Liquid pouch forming. Mechanical assembly. Develop special equipment.
	P				●				Single-use plastic pillow or bubble type containers for liquids, semi-liquids, (Similar plant in Los Angele
	P		●						Filling and packaging small runs. Custom hand work. Liquids and creams.
	P						Cups		Individual servings: condiments, dressings, jellies, sauces; rigid cups and flexible packets.
			●	●					Aerosol products — pharmaceutical, cosmetic, household; complete facilities formulating to shipping.
			●						All free-flowing liquids except volatile.
		●	●						Drugs, parenteral; all types.
		●	●	●					Private label packaging — all chemicals, aerosols, powders, pastes; bottles, jars, cans, bags. Quality co
	P								Lightweight flexible pouches for coffee, powders, detergents, etc.
			●						Filling and labeling of liquids and powders in the cosmetic line.
	●						B & S		Flexible unit packaging of capsules, tablets, hardware articles. Any type of hand filling.
		●	●			●	B		Drug and vitamin specialties in capsule, tablet or liquid forms.
	P								Unit packaging of liquids, powders, hardware — in bags and pouches of polyethylene, cellophane, foil, kr
			●						Liquid filling; large or small quantities. Development, laboratory, packaging, storage, shipping facilities.
		●	●				B & S		All types of pressure and vacuum forming, skin packaging. Blow molding.
	P								Unit and strip packaging of screws, nuts, bolts, O-rings.
		●	●						Motor oils; oil derivatives; weed killers; cleaners; floor waxes; degreasing compounds. Formulating, ship
	●		●	●					Aerosols of all kinds. Research and laboratory assistance and product development.
	P						B		Thermoformed blister packaging and automatic pouch making and filling process.
	●	●	●		●	●	B		Direct, arbitrary and response mailings to lists furnished by customers.
									Industrial, military, commercial wood crating and pallets.
			●						Package lubricating oils, anti-freeze, thinners, turpentine.
			●	●					Special facilities for aerosols, bottles and ethyl ether filling.
	W & P	●	●		●	●			Packaging for liquids, powders, greases; complete facilities for formulating, filling, storing and shipping
		●	●	●	●				Complete facilities, liquids, creams, aerosols. Printing and package design.
		●							Packaging, packing, crating. Custom-made cushioning, interior packaging. Military. Domestic. Export.

See continuation

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Guide to Contract Packaging Services

COMPANIES	TYPES OF PACKAGING						
	Foods	Drugs, Personal Items	Notions, Hardware, Toys	Chemical Specialties	Industrial & Shipping	W=Wraps P=Pouches	Boxes, Cart
MIDDLE WEST							
Acepak, Inc., Chicago, Ill.	●	●	●	●		W & P	●
Advance Packaging Co., Inc., Chicago, Ill.	●	●	●	●		W & P	●
Barco Chemical Products Co., Chicago, Ill.				●	●		●
G. Barr & Co., Chicago, Ill.		●		●			
Capitol Packaging Co., Melrose Park, Ill.		●		●			
Chase Products Co., Broadview, Ill.		●	●	●			
Claron Packaging Co., Glenview, Ill.			●			P	
Cloud Machine Corp., Chicago, Ill.	●	●	●			W & P	
Continental Filling Corp., Danville, Ill.		●		●			●
Continental Pkg. & Processing, Melrose Park, Ill.		●	●	●	●	W & P	●
Federal Packaging Corp., Chicago, Ill.	●	●	●	●		W & P	●
Help, Inc., Chicago, Ill.		●	●	●		P	●
Kolar Laboratories, Inc., Chicago, Ill.	●	●		●			
Major Packaging, Inc., Addison, Ill.			●			●	●
Packageers Co., Chicago, Ill.	●	●	●	●		●	●
Packaging Service Corp., Chicago, Ill.	●	●	●	●	●	W & P	●
Paket Corp., Chicago, Ill.	●	●		●		W & P	●
Peterson Filling & Packaging Co., Danville, Ill.		●		●			●
Tower Packaging Co., Wheeling, Ill.			●			P	
Unipack Corp., Chicago, Ill.	●	●		●		P	
Paper Package Co., Indianapolis, Ind.		●	●	●			●
Perfection Packaging, Inc., Shelburn, Ind.	●	●	●	●		W & P	●
Airosol Co., Inc., Neodesha, Kan.		●	●	●	●		●
Custom Packagers, Kansas City, Kan.	●	●	●			W & P	
The Penn-Central Co., Kansas City, Kan.				●	●		●
Export Corp., Detroit, Mich.			●	●	●	●	●
Liquipak Corp., Alma, Mich.	●	●		●		P	
All Packaging Co., Inc., Kansas City, Mo.		●	●	●	●	W & P	●
Douglas Chemical Co., North Kansas City, Mo.	●	●		●			●
American Packaging Corp., Cleveland, Ohio		●	●		●	W & P	●
Bernard's Laboratories, Inc., Cincinnati, Ohio		●	●	●		W & P	●
Custom Pak, Inc., Cincinnati, Ohio	●					P	
Ohio Packaging Co., Cleveland, Ohio			●	●		P	●
The T. J. Paisley Co., Medina, Ohio	●	●		●	●	W & P	●
Plasti-Kote, Inc., Cleveland, Ohio				●			
Products Packaging, Inc., Cleveland, Ohio			●	●	●	P	●
Sprayon Products, Inc., Cleveland, Ohio			●	●	●		
Strong Cobb Arner Inc., Cleveland, Ohio		●		●		W & P	●
Wright Package, Inc., Cincinnati, Ohio	●	●	●	●		W & P	●
SOUTH							
Averil of Florida, Inc., Miami, Fla.	●	●	●	●		W & P	●
Southern Packaging Service, Jacksonville, Fla.		●		●			●
Protective Packaging of Atlanta, Atlanta, Ga.			●		●	W & P	●
Diamond Plastics Industries, Roanoke, Va.		●	●	●			●
WEST							
Specialized Packaging Engineering, Phoenix, Ariz.			●	●	●		●
Academy Ribbon Mills, Burbank, Calif.			●			W & P	●
William Bishop Co., Burbank, Calif.	●	●	●	●		W & P	●
Cal-Western Manufacturers, Los Angeles, Calif.			●	●			●
Flex-A-Pak, Inc., North Hollywood, Calif.	●	●	●	●			●
R. Hurwich Co., Berkeley, Calif.	●	●	●	●		P	●
Jones-Hamilton Co., Newark, Calif.				●			●
Lawson Chemical Products Co., Gardena, Calif.				●			
McGuire Chemical Co., Oakland, Calif.		●		●			●
Multi-Pak Corp., Sun Valley (L.A.), Calif.	●	●	●	●		W & P	●
Norton Chemical Co., Inc., Los Angeles, Calif.		●		●			●
Packaging Corp. of America, Los Angeles, Calif.	●	●	●	●	●	W & P	●
Par Industries, Inc., Los Angeles, Calif.		●		●			
William Steven Co., Los Angeles, Calif.	●	●	●	●		W & P	●
Wilco Co., Los Angeles, Calif.		●		●		W & P	●
Stanley Drug Products, Inc., Portland, Ore.	●	●		●			●
Norton, Inc., Salt Lake City, Utah	●	●	●	●		P	●

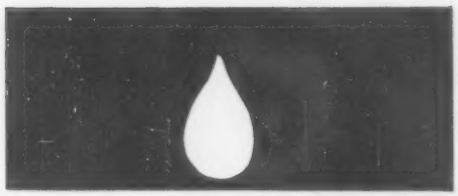
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ING	CONTAINERS HANDLED						
rial Shipping	W=Wraps P=Pouches	Boxes, Cartons	Cans, Bottles	Aerosols	Collapsible Tubes	Capsules	B=Bl… S=…
W & P	•	•			•		•
W & P	•	•			•	•	
	•	•					
				•			B & S
		•		•			
		•		•			
P							
W & P							B
	•	•		•			
W & P	•	•		•		•	B & S
W & P	•	•			•		
P	•	•					
		•			•		
•	•						B & S
•	•						
W & P	•	•					
W & P	•	•			•		B
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W & P	•	•			•		
				•			
P	•	•		•	•		
		Cans		•	•		
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W & P	•	•			P		B
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	•	•			•	•	•
P	•	•					

HANDLED			SPECIALTIES[1]
Compatible Tubes	Capsules	B=Blister S=Skin Packs	
		●	Plastic, metal tubes — all sizes. Pouches — high-speed on liquids, powder mixing, packing. Large volume.
	●		Automatic cartoning; tucking and gluing; liquid and semiliquid packaged 200 units per min.
			Cleaning specialties. Filling of liquid products from 4 oz. to 55-gal. drums.
		B & S	Complete formulations and packaging of all types of aerosols in glass, plastics and metal containers.
			Aerosols — complete research, compounding, filling service. Also liquids in cans, bottles, etc.
			Complete research, formulating and custom packaging of aerosol and pressurized products.
			High-speed custom packaging.
		B	High-speed blister packaging equipment. Form, fill, seal bagging machines and job-designed machines.
			Private label packaging of pressurized, liquid and powdered chemical specialties. Laboratory, quality control.
	●	B & S	Military specialists. Aerosols, skin, blister, automatic cartoning, engineering. Polyethylene and kraft bagging.
			Automatic and semi-automatic. Liquid and powder. Pouches. Assembly.
			Automatic and semi-automatic equipment; ½-oz. to 5-lb. size. Quality control guaranteed. Glue seal packets.
			Manufacture and fill wide range bottles, cans, tubes, blister packs. Formulating to shipping.
		B & S	Military specifications including precision bearing white area facilities. Commercial packaging.
			Small unit packages and assembling of metal specialties for parts, kits or rack merchandising.
			Wrapping and pouch-filling machines. Powders, liquids and solids.
		B	Liquids and powders in tubes, bottles, cans and packets, 1/8 oz. to 5 lbs. Capacity 100,000 a day.
			Aerosols. Liquids. Complete research. Fluorocarbon and hydrocarbon propellants.
			Custom hand-packaging of dry goods in polyethylene bags and pouches.
			Strip packaging of tablets.
		●	Folding cartons, set-up boxes, thermoformed cavities and cards, rigid plastic boxes with inserts.
			Package creation, design. Custom packaging in foils, cellophane, glassine, combinations.
			Fills range of aerosol products — cosmetics, pharmaceuticals, paints. Liquid fill, quart to 55-gal.
		B	Special facilities and services available.
			Polyethylene bags and tubes — all sizes. Fill 3-oz. and 4-oz. cans.
		B & S	Complete packaging and shipping service. (Similar plants in Grand Rapids, Mich. and Toledo, Ohio.)
			Specialize in liquids — heat-seal die unit packaging. Capacities from ½ gm. to 3 oz.
	●		Military and industrial packaging specialists. Domestic and export.
			Polyethylene tube filler; 1/8 to 6 oz. Dry and liquid filling. Complete facilities: formulating to shipping.
		B & S	Complete facilities — blister, skin-and flexible-film packaging. Design, production, warehousing, shipping.
		B & S	Automatic liquid filling line. Automatic tube filling.
			Complete facilities for packaging single-service foods; both flexible packages and plastic cup containers.
			Long, short runs. Liquids, granules, powder, hardware. Hand assembly. Warehousing, shipping.
			Specialty: food packaging. Special facilities (Commercial Packaging Corp.) for chemicals, industrials.
			Aerosol paint products and specialties.
			Complete facilities: formulating to shipping. Also silk screen work and hot stamping.
			Custom aerosol loading. Laboratory assistance and product development.
	●		Creative development, production and packaging. (Similar plants in New Jersey and Canada.)
		B	Plastic squeeze tubes: high-speed filling and sealing. Also plastic bottles and vials.
		B & S	Long or short runs. Formulating to shipping. Product development, warehousing.
			Bottle, cap, label, pack and ship. Repetitive formulating and/or packaging operations. Large volume items.
		●	Military specification packaging. Manual operations. Cushioned packaging.
			Rigid plastic boxes with thermoformed plastic and paperboard inserts.
		●	Engineered military, industrial, commercial, domestic and export. Boxing, crating. Blister packs.
			Consumer packaging of toy and notion items. Cylindrical packages.
			Single-portion flexible packaging. Liquid, paste, powder, granular, etc. Warehousing and shipping.
			Pilot and experimental runs. Powders, liquids, paste—fractional ounce and up.
	●		All types heat-sealed packages; pouches, strip-packaged powders, liquids, pastes, solids.
		B	Unit service packets. Plastic collapsible tubes. Complete packaging facilities. (Also in Van Nuys.)
			Integrated mixing, blending and packaging for liquids and drys; all chemical specialties.
			Complete aerosol custom packaging.
			Liquids, semiliquids. Formulating to shipping. ½ pt. to tank car. Water-side bulk storage.
			Flexible package development; unit packaging—tablets, capsules, powders. Shipping, billing.
			Semi- and fully automatic packaging lines. Complete services: compounding to warehousing and shipping.
	●	●	Complete packaging development, purchasing, manufacturing, warehousing. Drugs, cosmetics, household items.
			Aerosol packaging; custom, private label. Formulations. Glass bottles, cans. Liquid and gas propellants.
	●		All types heat-sealed packages—pouches. Tetrahedrons, strip—containing powders, liquids, pastes, solids.
		B	Liquids, semiliquids. ½ oz. to tank car. Formulating to shipping.
	●	●	Rail, tank car facilities; automatic packaging lines; quality control lab. Compound, warehouse, distribute.
			High-speed soft drink canning. Pouches for powders, liquids, tablets. Bottling. Formulating to shipping.



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Trends in packaging management

Significant changes are taking place in the organizational set-up for the administration of the packaging program. In contrast to the packaging committee approach of the past ten years, there seems to be a trend toward centralized control, vested in a full-time packaging coordinator. Frequently this involves top-management status and policy-making authority.

It should be pointed out, however, that there is still no one pattern of packaging organization that fits the requirements of all companies. There are vast differences that result from size, product considerations and marketing strategy. Even companies of comparable size, producing similar products for similar markets, may find that different approaches are needed.

Only one generalization seems valid. The heavy investment in packaging by various industries and by individual producers of products today demands the use of a planned and skillfully shaped approach.

This is essential for two important reasons. Packaging success is intimately related to sales leadership; and substantial economies can be effected by more than advisory supervision of packaging standardization programs, container inventory control and production-cost accounting.

Wherever there is an organized packaging program, substantial benefits have resulted. One company cut its types and sizes of containers from 180 to 30, greatly simplifying purchasing and inventory procedures. Another, in the first year of a new packaging committee set-up, placed company identification on 2½-million packages not previously labeled.

In effect, anyone with a product to package today must engage in two businesses—that of his basic product and that of packaging. These two cannot go separate ways as diverse products might. They are necessarily interrelated. So the manufacturer must build up basic knowledge, experience and personnel in two fields and then create a marriage of them.

Departments involved in packaging include: *product development*, which provides the article to be packaged; *technical research*, which lines up the materials and containers that can be used and may ultimately write the specifications for suppliers; *purchasing*, which determines availability and prices of materials and obtains samples; *market research* and *sales*, which measure the package against competition and customer preferences; *art* and *advertising*, which provide package copy and decoration; *engineering*, which works out the practical details of scheduling, tooling up and producing or filling the package; *traffic*, which keeps to a minimum transportation hazards and checks the advertising message shown on the case to eliminate claims which might result in higher classification and therefore higher transportation costs; *cost accounting*, which determines the feasibility of the whole project; *legal*, which assures compliance with any pertinent government regulations.

A review of the different procedures followed in various companies to achieve successful marriages of the best efforts of all these departments, it is believed, will be helpful to evaluate the effectiveness of each approach in relation to particular situations.

The packaging coordinator

In the new packaging coordinator set-ups, the decision-making head is in a position to establish policy with the assistance of all department heads concerned functioning in an advisory capacity. This procedure, it is believed, overcomes the previous conception of the packaging committee in which no member had the authority to make the decision. These new set-ups place a greater responsibility on each department head to provide the specialized knowledge that leads to a broader understanding of the over-all problems. At the same time, the nature of the arrangement demands of each department head greater awareness of the problems of the others—and more mutual respect.

The packaging committee

In many industries, the packaging committee continues to be the most widely used administrative approach.

One corporation that organizes its packaging work by means of the committee system has two committees—a packaging policy committee reporting to the president and an operating committee reporting to the policy committee. Chairman of the policy committee of three is the vice president of supply and inventory. Other members are the vice presidents of merchandising and manufacturing.

The operating committee is composed of representatives from the following line and staff departments: order and distribution, general sales and other (special) sales divisions, pricing and contracts, manufacturing research, industrial sales and consumer relations.

These departments are represented on the committee because each has some original departmental responsibility for a phase of company packaging. Responsibility for the advertising and the artwork that appears on the package rests with consumer relations. Scheduling and distribution include maintaining a pool of standardized packaging materials, handling of customer complaints often leading to a change in package, and the determination of units of sale. The research responsibility includes provision for a laboratory staff that reviews, tests and designs packages, tests materials, investigates and improves methods of handling, and develops standards for circulation to the various works.

All work of the operating committee is designed to develop recommendations for policy. When differences between divisions cannot be ironed out by the operating committee, the policy committee follows through on the matter.

A packaging committee of four in a smaller company—the vice president of sales, the director of product development, the vice president of production and the director of advertising—simply directs the plant technical committee to recommend a complete package and then the committee passes on it.

The technical committee, which meets monthly, consists of the vice president and assistant vice president of production, the production superintendent and his assistant, the purchas-



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ing agent, the quality control manager, the traffic manager and the methods engineer. In making recommendations, the technical committee is expected to obtain sample units, work them into the laboratories, check production requirements, highlight any cost changes, receive the reports and compile the story.

Sometimes, in extremely large corporations, the packaging committee is a forum for the exchange of ideas by the divisional policy makers on packaging. This function has developed in several companies that have tried company-wide control of all packaging detail, only to return most of the responsibility to a divisional level. One such company has created a packaging director who is liaison man between the divisional heads and the corporate officers and coordinates packaging efforts in such areas as cost, efficiency and brand identity.

The packaging department

The packaging or packaging development department, where it exists, seems not to have complete autonomy in the company structure. One company may make it part of the research and development department; in another company it may be part of purchasing and traffic.

One company divides the department into five sections: *changes, design, specifications, laboratory* and *cost analysis.* The department is headed by a director of packaging.

In another company, where the package development department is a part of purchasing and traffic, the department serves as an advisory body for all divisions of the corporation. It has a manager and an assistant manager who with their assistants service all divisions of the company by (1) periodic visits to the manufacturing plants for consultation and help in connection with packaging problems; (2) attendance at various technical committee meetings to propose and discuss problems connected with packaging and labeling as they may affect the entire industry; (3) keeping abreast of all existing state and Federal legislation regulating packaging and transportation.

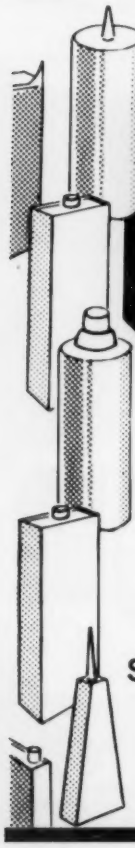
The packaging engineer

In one large company where the position of packaging engineer might be said to reach optimum development, his staff is a division of a central engineering department having 11 staff engineers and serving 30 company plants.

Here the packaging engineer has established a complete library of packaging information which includes: (1) a blueprint of each of the company's packages; (2) file samples of all packages; (3) a record of all machinery and equipment; (4) a file of information on all types of packaging materials and equipment offered by manufacturers; and (5) a file of standard reference material.

The packaging engineer is represented on a company packaging committee and, when a request for a particular packaging job is made, he has at his command a wealth of information on materials and equipment, drafting facilities for drawing up the design, a machine shop for adapting mechanical equipment to the job, and a laboratory for making tests and building pilot models.

Packaging operations for some firms are so extensive and diversified that each product division or plant has its own set-up. In one firm, each product division handles its own packaging, but central design and engineering departments assist when needed.



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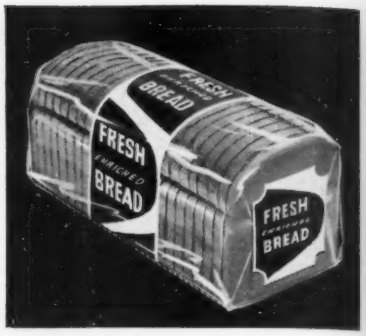
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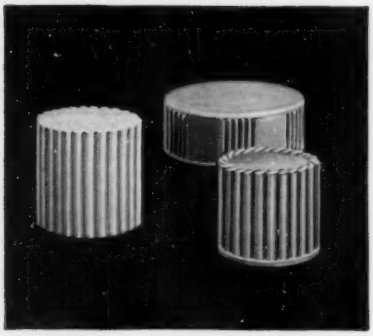
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5 PLASTIC MOLDING COMPOUNDS

Avisco urea formaldehyde molding compounds are used to make bottle and container closures, colorful caps and cases.



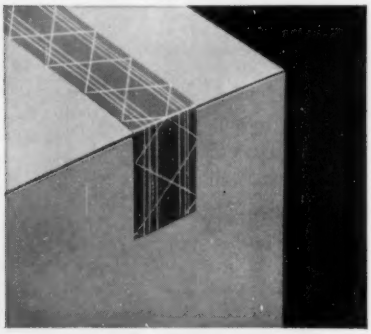
6 RAYON INDUSTRIAL SEWING THREAD

Yields up to 30% greater yardage per dollar; offers greater strength and trouble-free sewing on bag stitching machines.



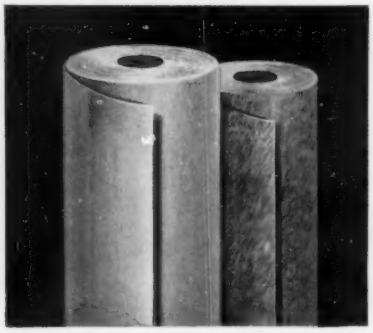
7 RAYON STAPLE

Clean, white Avisco rayon staple is placed in necks of pill bottles to prevent pill breakage. No static hazard. Virtually lint-free.



11 RAYON FOR REINFORCED TAPES

Rayflex® filament yarn adds strength and flexibility to packaging tapes at low cost — for a wide variety of uses.



12 RAYON FOR SPECIALTY PAPERS

Avisco rayon can be used in the pulp blend to give added flexibility to heavy paper or paperboard — decorative effects to paper.

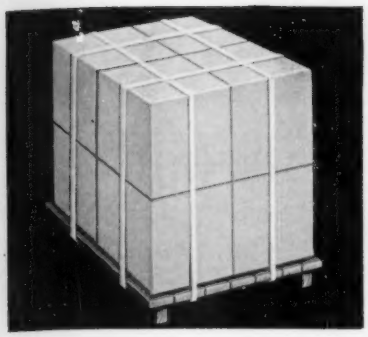


13 RAYON AND ACETATE FOR RIBBONS

Avisco rayon and acetate are widely used to manufacture many different kinds of ribbon for use in gift packaging.

AMERICAN VISCOSE CORPORATION, PACKAGING DEVELOPMENT SERVICE

See other Avisco packaging materials, pages 186, 381 and 667.



2 AVISTRAP® CORD STRAPPING

Outperforms metal strapping—at lower cost—in many applications. Safe and light in weight. Eliminates disposal problems.



3 CELLULOSE BANDS

Avisco cellulose bands provide a visible, tamperproof seal around the neck of a bottle or jar. Printed bands are available.



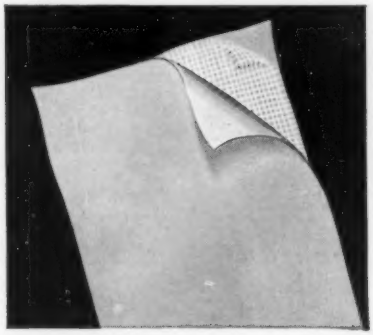
4 CASINGS

Avisco transparent and fibrous casings offer meat processors easier stuffing, uniform shapes and more full slices.



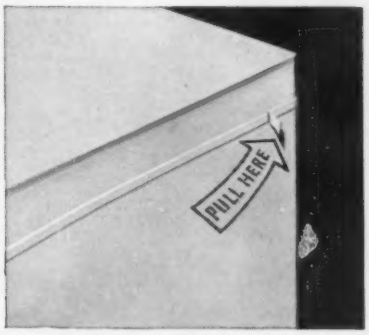
8 CELLO-CELSIOR® SHREDDED FILM

Shredded cellophane is used by many manufacturers to cushion delicate objects. It also adds decor to a gift-type package.



9 RAYON FOR REINFORCING

Rayflex® filament yarn is used to make scrim, which is laminated with paper, film or foil to give added protection.



10 RAYON FOR TEAR TAPES

Tear tapes made of Avisco rayon simplify the opening of cartons. No cutting required. No resulting damage to contents.



14 RAYON FLOCKING

A velvety texture can be simply and economically applied to boxes and containers by spraying with flock of Avisco rayon.

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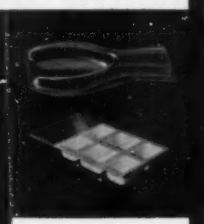
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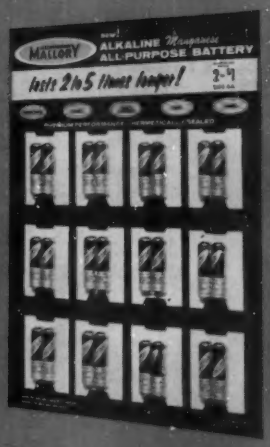
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selling *your* product is *our* business

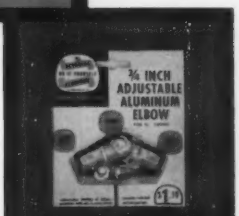










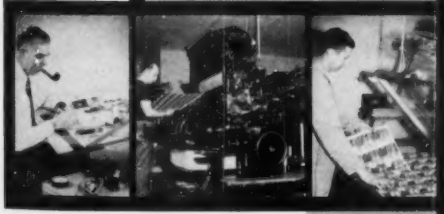






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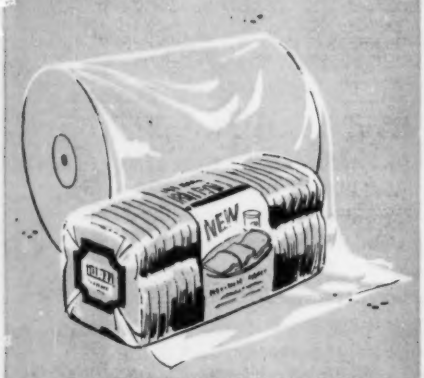
SIX TENITE® PLASTICS

give you a "designer's choice" of packaging benefits

POLYETHYLENE

Tenite Polyethylene is a versatile plastic that solves many packaging problems. In extruded film, its high degree of sparkle and clarity has made it a favorite with both extruders and packaging users. In the form of squeeze bottles and other containers it results in virtually unbreakable "packages" of exceptional gloss. Light in weight, inert to most chemicals, resistant to moisture and moisture-vapor transmission, Tenite Polyethylene is dimensionally stable and remains flexible over a wide temperature range.

Tenite Polyethylene is available in a range of densities for injection molding, blow molding, or continuous extrusion; and in a wide range of colors and color concentrates.



Typical Packaging Uses: Film for produce, bread, and soft goods. Heat-sealable coatings and laminates for paper, film or foil. Virtually unbreakable bottles, boxes, jars, and closures.

BUTYRATE

Tenite Butyrate is an extremely tough, lightweight thermoplastic with excellent impact strength, high surface luster, resilience, dimensional stability, and good fabricating properties. It is easily lacquered, or decorated by hot stamping or printing; can be joined with a solvent cement; and resists the effects of most oils, greases, weak acids, and alkalies.

Tenite Butyrate is available in a wide variety of formulations and an almost unlimited range of transparent, translucent, opaque, metallic, and variegated colors, plus crystal-like clear transparent. It can be injection molded, blow molded, or continuously extruded as film, sheet or tubing. Sheet of Butyrate, moreover, can be rapidly and economically formed in sharp detail by the application of heat and vacuum, mechanical, or hydraulic pressure.

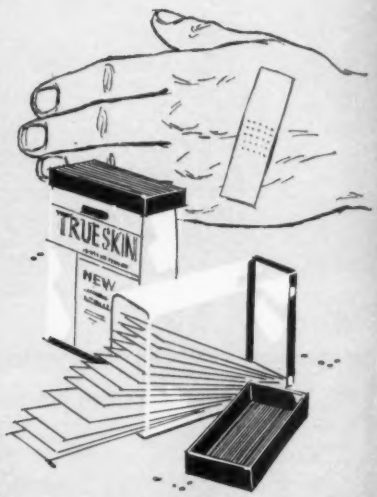


Typical Packaging Uses: Vacuum- or pressure-formed containers, blisters, bubbles, and skin packs. Rigid transparent and colored boxes, sleeves, tubes, vials, jars, and display components.

PROPIONATE

Tenite Propionate is a cellulosic plastic with physical characteristics that, in general, range between those of Tenite Acetate and Tenite Butyrate. These include good strength and fabricating properties.

Tenite Propionate is available in a variety of formulations and colors ranging from clear transparent to opaque. It is adapted to rapid injection molding, blow molding, extrusion, and vacuum forming, producing parts of high surface luster.



Typical Packaging Uses: Cosmetic and jewelry cases, jars, boxes, sleeves, closures, vials, blister and skin packs.

Planning the best package for your product includes finding the best material for your package. In making a selection, designers like to choose from the broadest possible range of properties.

This step is expedited by the six TENITE plastics—Butyrate, Acetate, Propionate, Polyethylene, Polypropylene, and Polyester—each available in a wide variety of formulations. So many materials and properties at one source make for fast, easy selection. And the Eastman technical representative can give helpful advice on the best combination of packaging features for your needs.

Such requirements may include flexibility or rigidity... transparency or opacity... printability... moisture barrier characteristics... or other special properties. If color is important, you can select from more than 42,000 colors and color effects available from Eastman in Tenite plastics.

A good starting point is to call your Eastman technical representative. You'll find his office listed under "Plastics—Tenite" in the classified telephone directories of the following cities: Atlanta, Chicago, Cleveland, Dallas, Dayton, Detroit, Greensboro (N.C.), Kansas City, Leominster (Mass.), Los Angeles, Minneapolis, New York City, Philadelphia, Rochester (N. Y.), St. Louis, San Francisco, Seattle, Toronto.

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ACETATE

Tenite Acetate is the original Tenite plastic, and offers the packager a wide range of desirable properties such as toughness, light weight, impact strength, surface luster, low heat conductivity, and good fabricating properties. It can be easily joined with a solvent cement, is readily lacquered for decorative purposes, and resists the effects of most oils, greases, weak acids, and alkalies.

Tenite Acetate is available in a variety of formulations and almost unlimited colors plus crystal-like clear transparent. It is adapted to fast injection molding or continuous extrusion, and sheet of Tenite Acetate forms readily with vacuum or pressure, on simple equipment, in short, economical cycles.



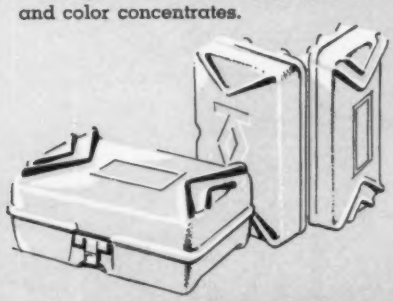
Typical Packaging Uses: Metal-decorated lipbrush cases and other tubular containers, transparent and colored boxes, sleeves, vials, jars, and closures. Vacuum- or pressure-formed containers, blisters, bubbles, and skin packs.

POLYPROPYLENE

Tenite Polypropylene can be easily extruded into brilliantly clear, tough film; injection molded into glossy containers; or blow molded into virtually unbreakable bottles. Virtually inert chemically, it is also resistant to moisture and moisture-vapor transmission, has low permeability to gases, mineral and vegetable oils, and is dimensionally stable. In addition, Tenite Polypropylene is heat-sealable. It has excellent draw-down characteristics for skin and blister packaging, and adheres to uncoated board. Polypropylene is among the lightest of all solid plastics.

High flexural strength permits designing one-piece Polypropylene containers with a "built-in hinge".

Tenite Polypropylene is available in various formulations for continuous extrusion, injection molding, or blow molding; and in a wide range of colors and color concentrates.



Typical Packaging Uses: Closures and molded or extruded containers. Film for food, textile, and industrial products. Skin and blister packaging. Blown bottles.

POLYESTER

Tenite Polyester resin yields a sparkling clear film of amazing strength. The film's low moisture absorption and high heat-distortion temperature produce excellent dimensional stability. Film is virtually unaffected by common chemicals and most solvents, and does not dry out or become brittle with age. Its good physical properties are retained from sub-zero cold to temperatures above boiling water. Film can be coated with various heat-sealable materials for fast, efficient closures on packaging lines.

Tenite Polyester is available* as extruded film or sheet for vacuum metallizing, printing, laminating, stamping, or vacuum forming.

*From Terafilm Corporation, Stamford, Connecticut.



Typical Packaging Uses: Pouches, envelopes, and bags for foods, soft goods, and industrial products. Windows for cut-out boxes. Bundling and overwrapping. Metallized package components. As a laminate with paper, film, or foil.

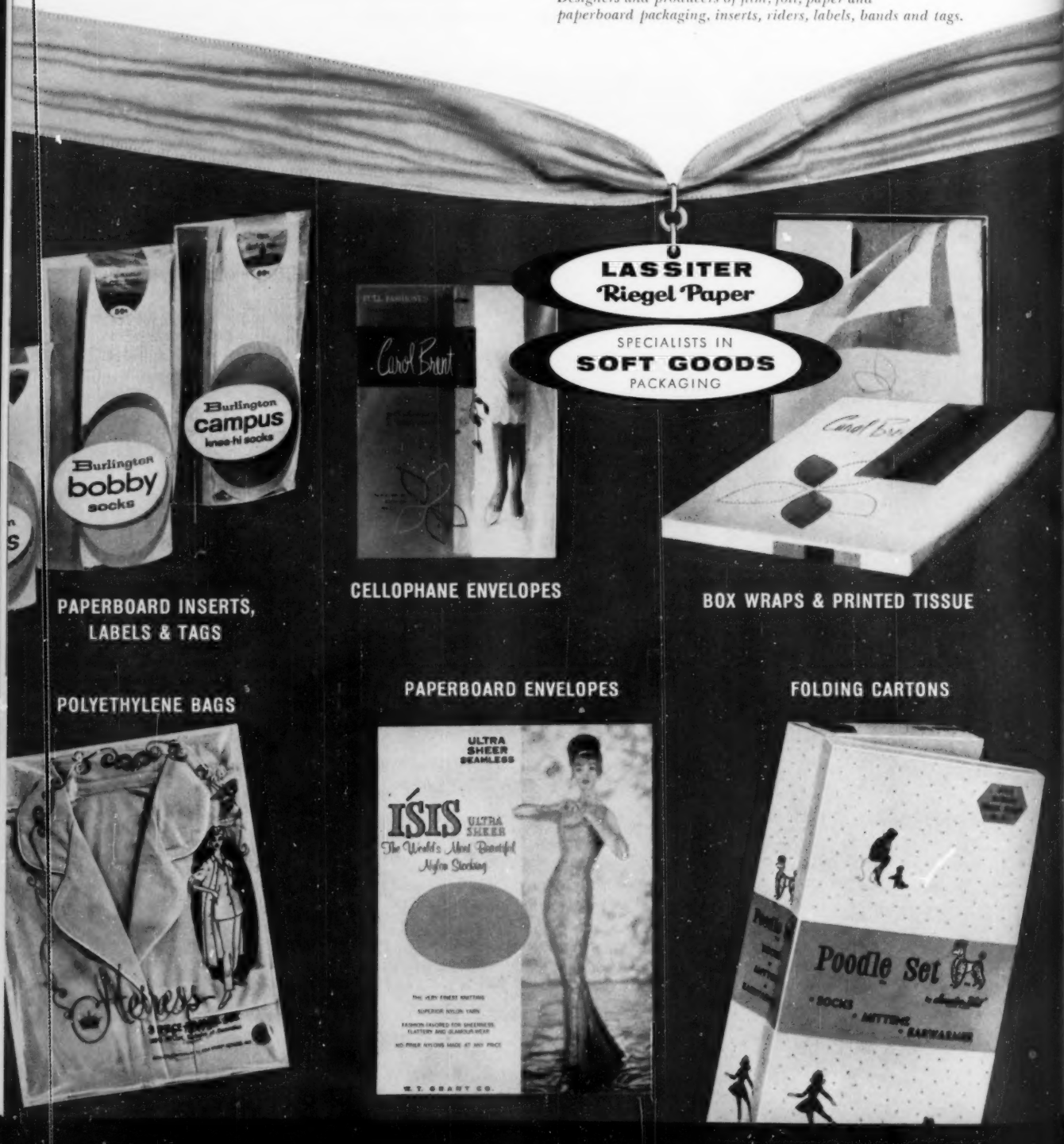
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Film and Sheeting

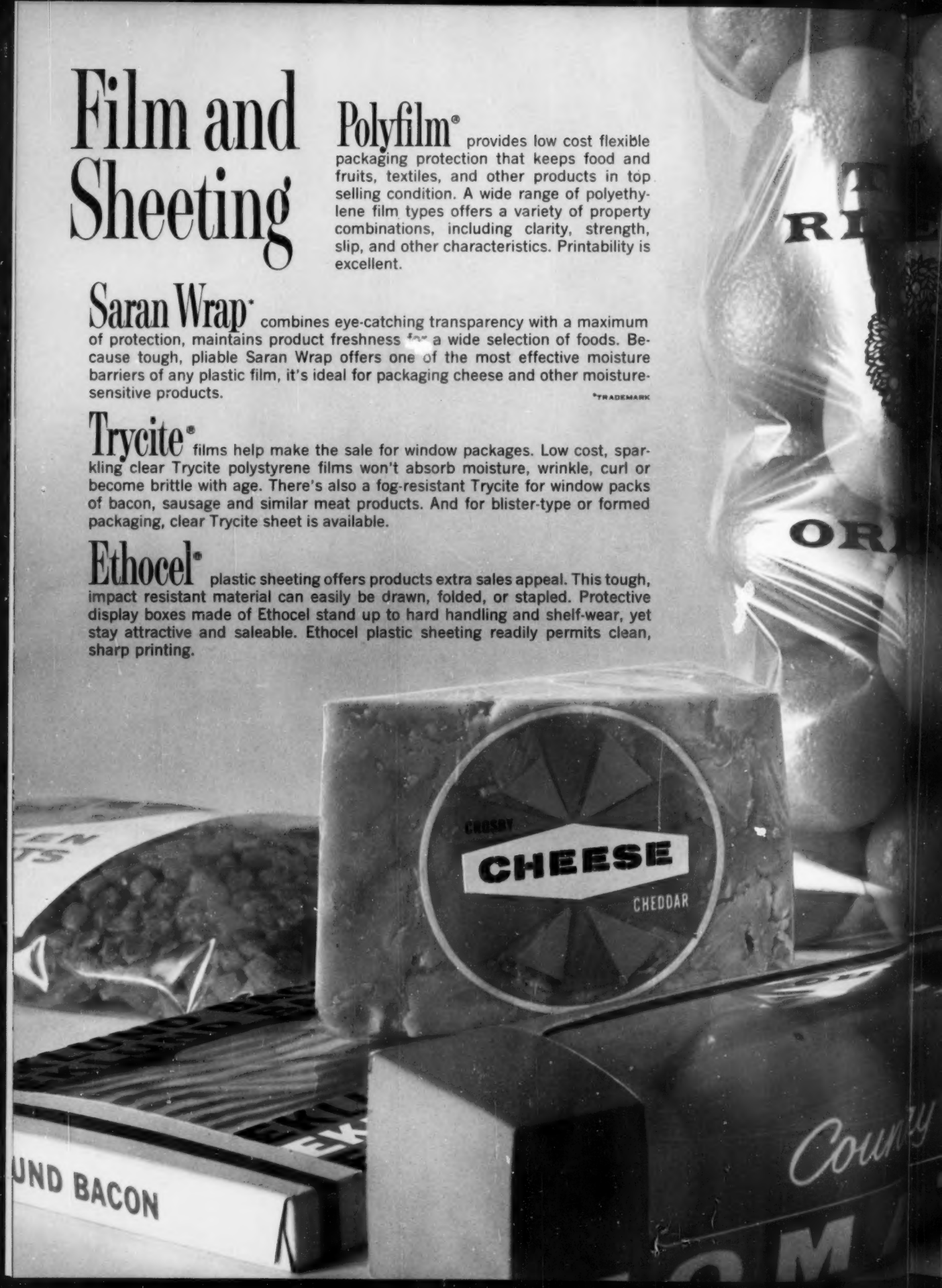
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*TRADEMARK

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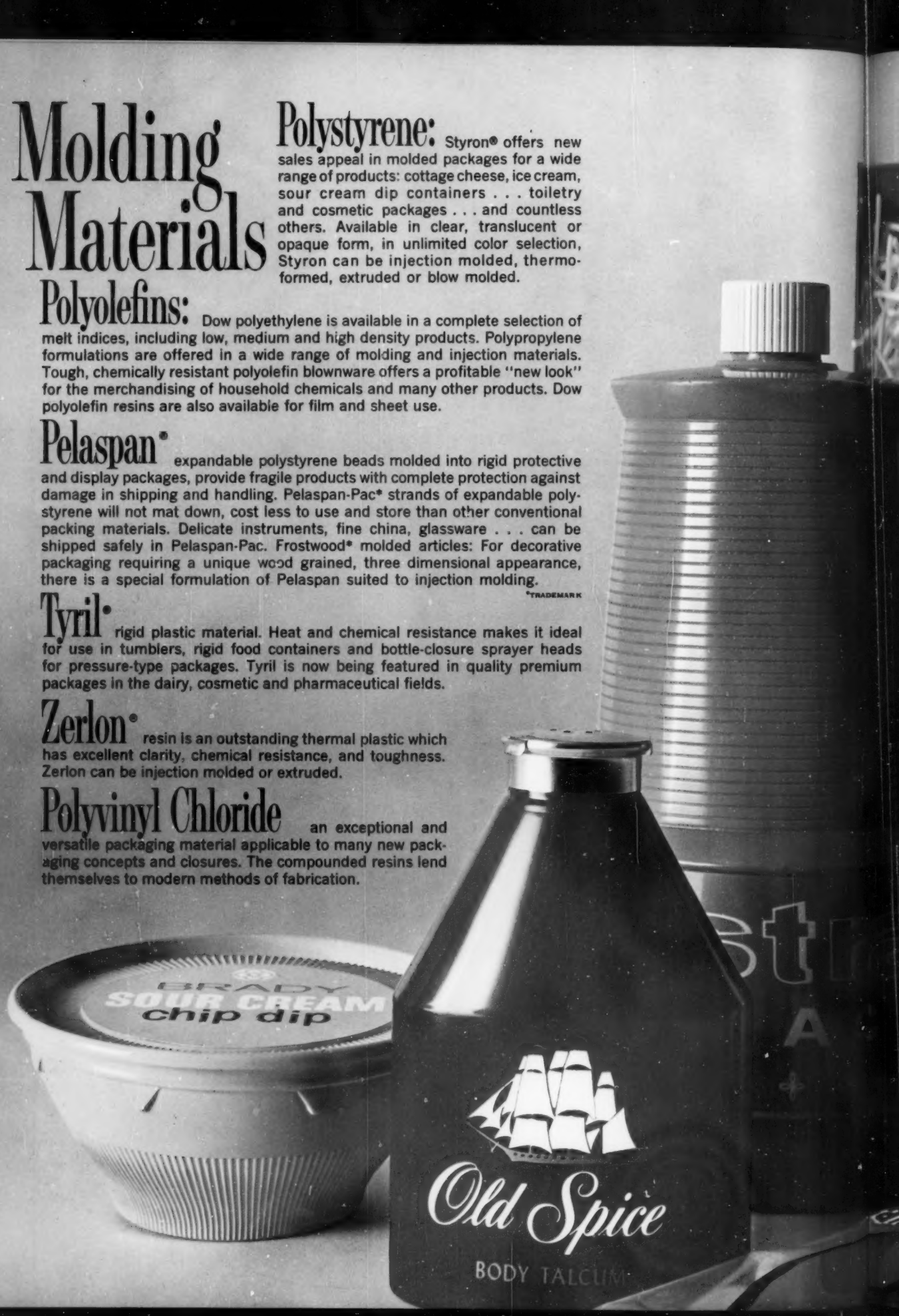
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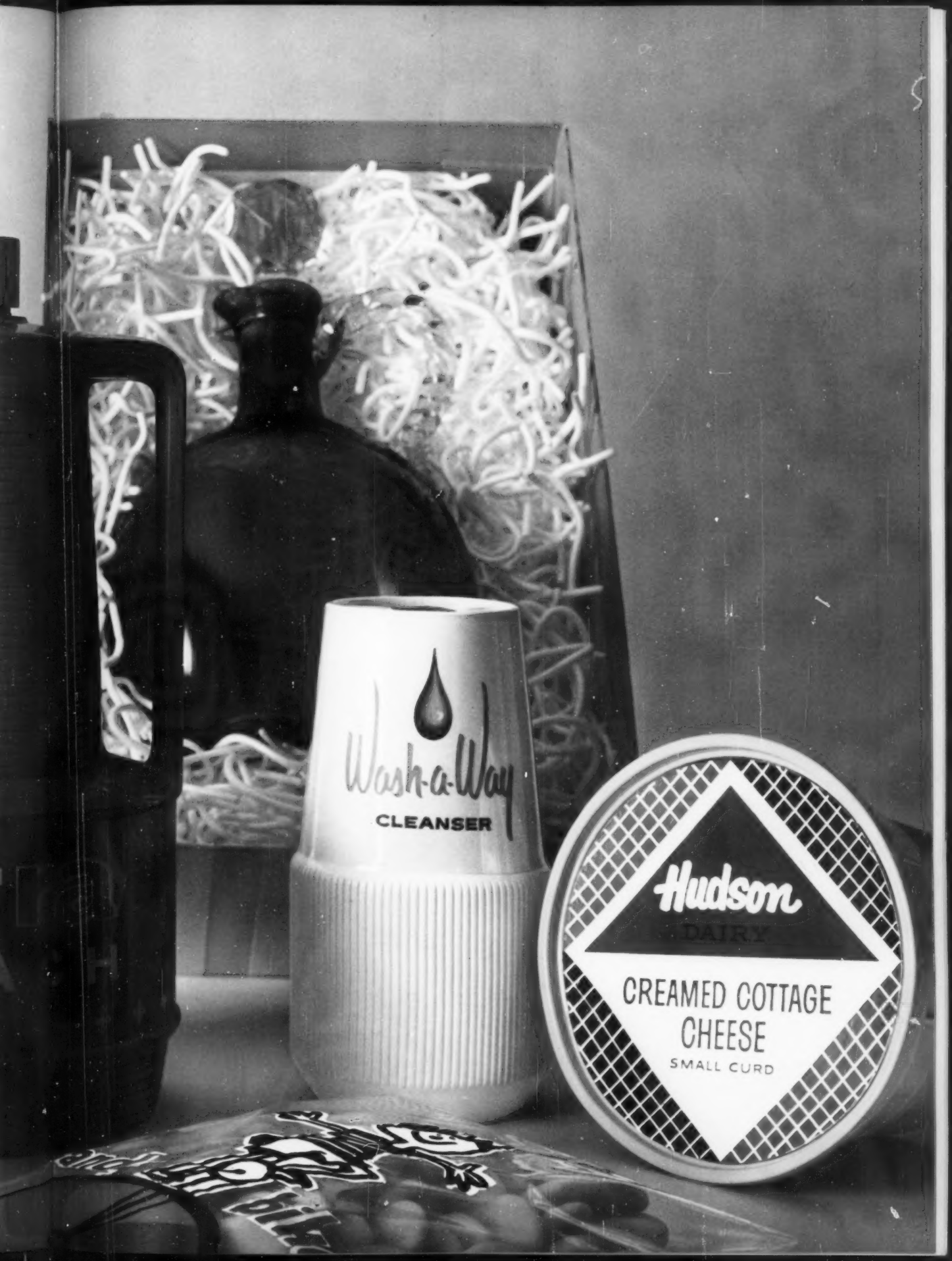
*TRADEMARK

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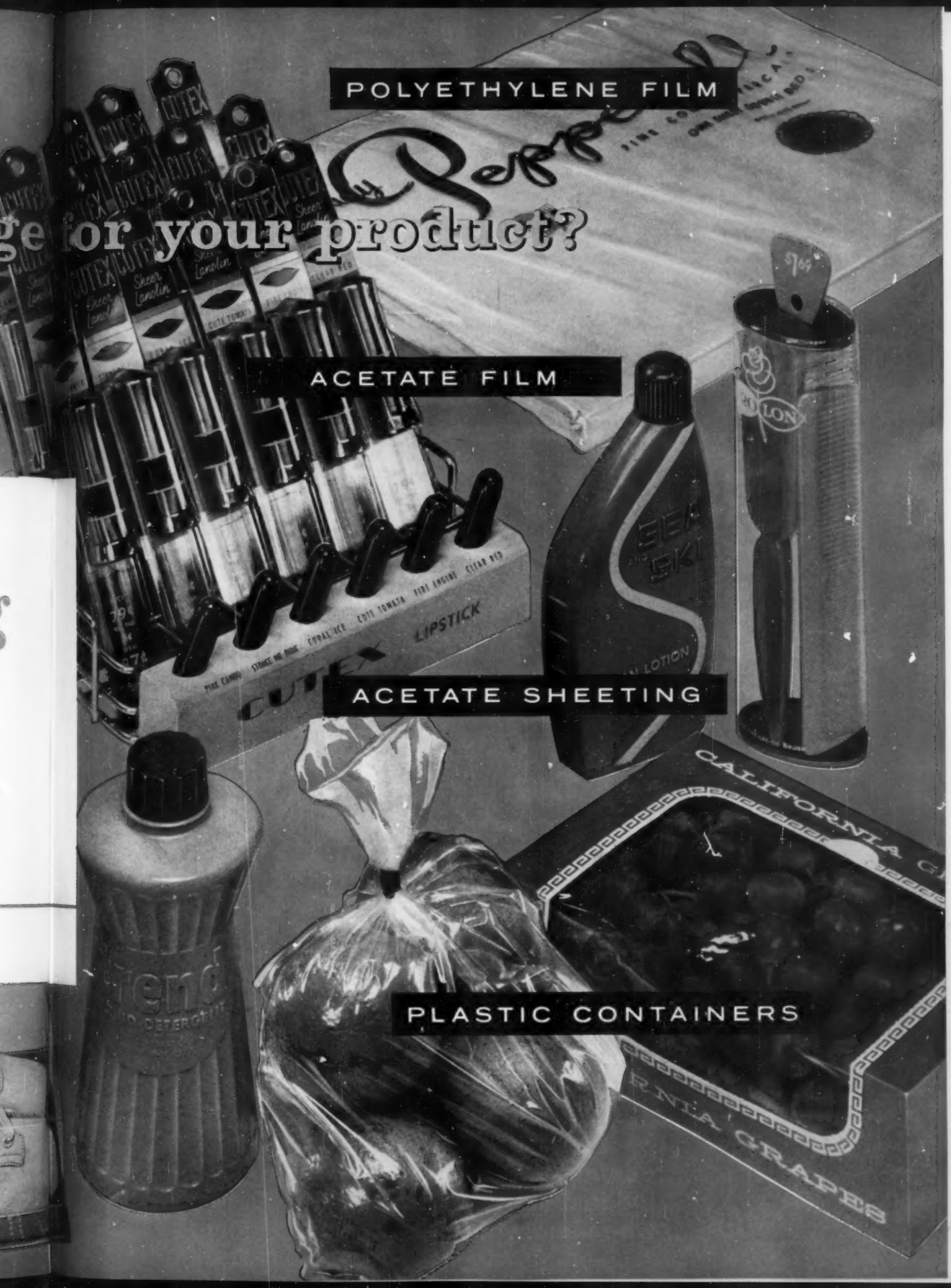
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SECTION 3

PAPER, PAPERBOARD, COATINGS

PACKAGING PAPERS—types and uses

There is a tendency to take for granted the progress constantly being made by the paper industry. Yet the industry's record for keeping pace with the fast-developing packaging field is noteworthy and instructive.

The following articles point out recent evolutions and describe some of the major present-day paper types.

Technical advances

by Gordon C. Inskeep*

In the paper industry, modern research laboratories are geared to seek and find improved ways to package both new and old products. Such research has led to the discovery of many versatile packaging papers that may be designed exclusively for a specific product according to the customer's specifications. Packaging papers are laminated, formulated, treated and coated to provide a constantly improving range of functional and decorative characteristics.

Machines for both paper making and converting, along with innovations in the paper-making process, have been improved to bring about steadily rising production rates and more consistent quality in the product. Some of the newer Fourdrinier machines can attain speeds up to 2,500 ft. of paper a minute, and a modification of the Fourdrinier (Inverform) has produced paper and board at even higher speeds.

Bleached kraft is being produced in grades stronger and lighter than heretofore. Density, caliper and moisture content are more rigidly controlled during the paper-making process than had been believed possible. Radioisotopes, electronics and computers are being used in pulp and paper mills to help attain optimum quality and uniformity. Special coatings applied at full machine speeds are upgrading kraft paper and board in appearance, printability, grease resistance and barrier properties.

Paper and board continue to account for at least one half of the dollars spent for packaging materials. Also, the combination of paper and plastics has opened areas for the use of paper in combination with wood, steel, aluminum, glass and other materials—uses which paper, by itself, would not be able to undertake.

Polyethylene now is available in a range of densities giving tailor-made plastic-paper combinations with a range of barrier properties. Improved extrusion techniques have made it possible to lay on a reduced amount of plastic without appreciably decreasing the barrier properties. One optimistic producer of polyethylene has estimated that paper, paperboard and corrugated users of this material will jump their consumption of polyethylene from three million pounds in 1960 to 50 million pounds in 1963. Among the big gainers for polyethylene-paperboard are milk cartons and containers for liquid diet foods.

The combination of polystyrene foam with kraft paper, first as a rigid sandwich material and more recently as a flexible combination, has opened a whole new field of packaging. The rigid sandwich-like lamination of kraft and foam retains high compression strength under severe humidity conditions. Light in weight, but strong, this material affords high water-vapor protection, has good insulation properties, and is easily fabricated into many shapes.

The flexible application is essentially a material in which a sheet of resilient foamed polystyrene is bonded to a flexible sheet of paper or other material. This combination is inexpensive, waterproof and greaseproof, has a high thermal insulation factor, is chemically inert and non-abrasive.

The polystyrene foam assumes additional strength when the foam is laminated to paper. It gains the inherent strength of the paper which can be manufactured in a wide variety of weights, strengths and treatments. The insulation qualities of the material lend themselves to application for drinking-cups and food-packaging.

Foil laminates are enjoying a steady growth. Laminated foil-board bodies for composite cans using all-metal ends is one example of expansion. Improved foil-printing techniques have upgraded the foil-board carton.

Other combinations that have seen recent development are metalized papers, glassines and paper-textile materials. The latter is used in laminated waterproof, paperlined (WPPL) multiwall bags.

The extensive use of glassine and greaseproof papers has been a major factor in the development of present methods of food packaging, handling and distribution. Today several hundred grades are available in a range of basis weight and thickness, color, finish, opacity or transparency, density, grease resistance, and flexibility or surface characteristics.

Pouch papers are being developed with functional and adaptable structures to suit a wide range of products. These papers usually are combined with polyethylene and foil, depending

*Manager of Technical Planning, St. Regis Paper Co., New York City.

on the kind and degree of protection the product requires. Unit-of-use packages that utilize pouch papers are bringing new convenience to the consumer and economy to the packager. Examples are boilable packages made of paper-polyethylene for vegetables and paper-polyethylene pouches for liquid bleach.

Laminated (WPPL) bags provide an excellent example of the many possibilities opened through the combination of materials by lamination. Though WPPL is the designation for "waterproof paper lined," this term is sometimes misleading in view of the fact that plastic film is sometimes used as a substitute for paper. The material used in the manufacture of these bags is basically a combination, by lamination, of one or more layers of stretchable paper or plastic film with a textile, usually burlap. From three to five layers are commonly used. As a rule the textile provides strength, and the laminating materials and other layers provide special protective features. Sometimes burlap is sandwiched between two layers of paper for better printing surface and appearance. The inner ply or plies, made into a bag, can be composed of specially treated papers or plastic films.

Combining in one bag the best physical features of both cloth and multiwall bags, a wide range of combinations and plies now provides adequate protection for a given product.

Extensible papers are gaining a bigger share of the market as more producers adapt their paper-making machinery to the process and converters learn the best use for them. First used in the multiwall bag field as a higher-strength replacement for usual kraft plies, they now have spread to single-ply bag applications. They also offer promise as core stock for decorative laminates.

Another development in this area has been the introduction of embossed extensible paper into multiwall bag construction. This product has all the characteristics of regular extensible papers and, at the same time, provides better handling and stacking features and a high resistance to scuffing.

More often than not, paper for packaging purposes is tailor-made to customer specification. Paper specifications vary according to the requirements of the product to be packaged. Weight, strength, surface smoothness for good printability, cost, and resistance to water, chemicals, gas, etc., are some of the factors taken into consideration. Whereas the basic requirements determine the base sheet to be used, the exact product requirements determine the processing and coating.

Kraft paper

by Alfred S. Nalle*

Kraft paper takes its name from the identical word in both the Swedish and German languages meaning "strength." Although the basic process was a European development nearly thirty years earlier, it was not until shortly before World War I that the manufacture of kraft paper was undertaken seriously in America. Once begun, the inherent adaptability of kraft paper for a wide variety of uses earned for it the distinction of being the fastest-growing grade in the already-gigantic paper industry.

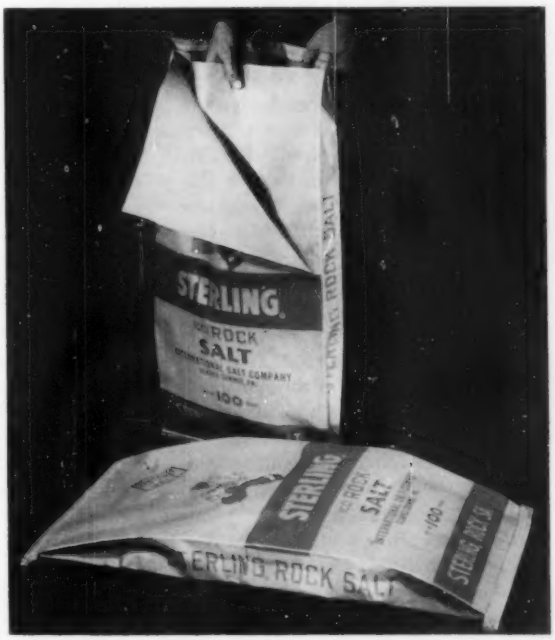
In its most common state, kraft paper is the ordinary brown wrapping paper of our everyday life. Its modifications are many, however, and its uses are legion.

Bleached and semibleached or colored krafts are mostly tailored to specific needs where the particular characteristics are related to some decorative or display requirement in the package to be achieved. While these special types constitute a vastly important group, it is our familiar brown, or natural, kraft that is the real work horse in this great team of packaging papers. Natural kraft is most often called simply "kraft."

Kraft is manufactured in most sections of America where coniferous wood is available, but its heaviest concentration is in the southeastern area of the United States, where pine and certain desirable types of hardwood are more abundant. Regardless of where kraft is made, the process is essentially uniform and the paper is all derived from sulphate pulp, which in turn is the product of an alkaline digestion of wood chips. It is characteristically a long-fibered stock of good bulk and pliability.

To be economically practical, a kraft mill must be of large capacity. As such, it is a tremendously complicated affair involving a pulp mill, a paper mill of one or more machine units, a maze of accessory equipment, a power plant, chemical by-product facilities, an elaborate water-treatment and sewage-disposal system, wood storage yards, bulk freight facilities and all of this backed up by thousands of acres of forest lands. The capital requirements for modern kraft mills are unbelievably large, and even the smaller ones run into an investment of many millions of dollars. Such a complex is geared to operate 24 hours per day, 7 days per week, and as near 365 days per year as conditions will permit. Maintenance for these mills is a specialized science in itself. The personnel requirements

*West Virginia Pulp & Paper Co., New York City.



IMPROVED multiwall bag. Four-ply carrier has one layer of 50-lb. paper with 1-mil coating of medium-density polyethylene. Said to reduce bag price 2% and WVTR 17% over bag with 6-mil coating of conventional polyethylene. Fabrication with higher-density resins and special coating process reduces amount of polyethylene needed for an effective barrier. *(St. Regis photo)*



EXTENSIBLE paper's inherent strength utilized for bags of lighter weight. Extensible paper bags, used for polystyrene resin, are five-ply—three of 40-lb. and one each of 50- and 60-lb. basis weight—for 230-lb. total, a saving of 30 lb. in basis weight over previous multiwall construction. A 7% reduction in bag cost is gained. Greater pliability allows resin to fill out gussets more readily, resulting in easier fill. Better handling helps avoid problem of underweight filling. *(Clupak photo)*

run the gamut of our modern educational capabilities and the specialization demanded has tended to develop a vast army of career men within the kraft paper industry.

With this background in mind, one can better understand a particular piece of kraft to be evaluated.

The complete range of weights and thicknesses runs all the way from tissues to boards but the great majority of kraft is in basis weights of 30 to 70 pounds. This means that a ream of 500 sheets of paper, size 2 ft. by 3 ft. (24 in. by 36 in.), or 3,000 sq. ft. total area, will weigh the designated number of pounds. Actually, very little kraft is finished in sheet form, but this basis weight method is the most practical way of expressing the ratio of weight per unit area, even when the paper is in rolls.

In any given piece of kraft the weight will vary according to humidity changes and this is a very important matter, whether the cost be reckoned on the basis of the pound or of the square foot. In the manufacturing process, the kraft fibres are felted into a web from a mixture of more than 99% water. Subsequently the water is extracted to a point where the moisture content of the dry paper is normally in the range of 5 to 8% of its total weight. To dry the paper further would serve no useful purpose but rather would tend to destroy certain vital properties of this sensitive cellulosic hydrate. The accepted standard of basis weight is the calculated scale weight of 3,000 sq. ft. of kraft exposed for 24 hours to moving air having a relative humidity of 50% and a temperature of 73 deg. F. Since it is impractical to handle so large an area of paper for testing purposes, a relatively small sample is chosen. Such a sample is generally less than one square foot in size, and so it follows that its precise weight, dimensions, and moisture content are of the utmost importance; it should also be truly representative of the lot from which it is taken. Any small error in sample testing will be multiplied several thousand times.

Packaging is a very broad field, so the selection of the proper kind of kraft for a particular application can become quite involved. Generally many factors must be carefully balanced to get the best performance.

Kraft is expected to perform work. This means that it should have reserve strength in excess of the work requirements. By and large, the strength of kraft is in direct proportion to its weight. There are other considerations, however, such as pliability, which limit the degree to which the weight or thickness might be extended. To illustrate, suppose there is a unit of material that requires the work potential of 180-lb. basis kraft for safe bagging. A single sheet of 180-lb. basis would be so stiff and unyielding as to destroy its functional value. But a combination of, say, two plys of 50-lb. with two plys of 40-lb. basis kraft would produce a most satisfactory shipping sack.

Translating work potential into strength specifications for a particular job is a delicate procedure requiring expert knowledge of the peculiar characteristics of kraft paper and the nature of the commodity to be packaged. Strength must be defined in specific terms. Not so long ago, bursting strength, or Mullen test, was the generally accepted yardstick of strength. A pane of glass will produce a very high Mullen test but its folding endurance is grievously low. By similar but more scientific reasoning, it becomes clear that neither of these time-honored tests tells the whole story. Tensile test is introduced to get a look at a certain characteristic and it is found that these results have a correlation with Mullen test.

Tear resistance must be considered to reflect another facet. It appears that when tensile goes up, tear goes down, and vice versa. For a long time the element of stretch in kraft had been vaguely regarded as being desirable, but unfortunately this measurement, like the others, was at the point of failure, and the results were confusing. Ultimately, research revealed the hidden values of stretch and, when dynamic methods were devised for evaluating them, it led to the greatest development in the manufacture of kraft in a half century.

Other physical characteristics to be considered are density, caliper, finish, and their relation to weight. If one is changed ever so slightly, the others are affected to some degree. Sizing, too, can be a critical factor. The normal sheet of kraft contains sufficient sizing for general purposes but if, for some special application, excessive sizing is specified a low *p*H must be expected. Heavy doses of conventional sizing agents require acid surroundings in order to endure and it is well to remember that high acidity is seldom desirable in kraft.

A revolutionary development occurred in 1958 when "extensible" kraft paper was introduced. The new concept of strength concerns toughness which associates the amount of useful work being performed, with the per-

iod of peak load, while the sheet is gradually yielding before the breaking point. This type of kraft features a controlled stretch which might be set at, for instance, 10% to enable it to withstand impact shocks. This property is achieved by subjecting the wet web of paper, while still in the paper machine, to the recoil action of an extended endless rubber blanket. At the point of recoil the wet paper is confined between the rubber and a polished revolving cylinder in such a fashion that the fibres are being pushed back on one another continuously. From the point of shrinkage the paper continues through the normal paper-making operations.



VARIED PROTECTIVE needs—pouch paper with foil (pouch A) and polyethylene coating (pouch B). (*Riegel photo*)



PAPER POUCH is polyethylene coated for good moisture barrier, strong heat seal, great economy. (*Crown Zellerbach photo*)

Pouch paper

Pouch paper is a special stock first produced in 1938. It is made to be used in combination with film and/or foil to form pouch-style packages on fully automatic, roll-fed, form-and-fill machines. It is a strong, pliable, opaque, virgin kraft paper, usually bleached, specially refined, highly plasticized and supercalendered in the same manner as glassine. Unlike glassine, it has no greaseproof properties but has substantially greater strength and pliability than most other packaging papers. It has the purity associated with highly bleached virgin fibres and is aimed particularly at food packaging. It has high density, a smooth surface and good "hold-out" (i.e., surface wax or coatings do not soak into the sheet).

Pouch paper has a superior printing, coating and laminating surface. It is usually converted for ultimate fabrication on packaging machines by coating with lacquers or laminating to itself, to foil, to glassine, to polyethylene or to other papers. It can be printed by flexography, gravure or letterpress. It can be coated with solvent-type thermoplastic and thermosetting lacquers, polyethylene, wax and hot melts.

Pouch paper gives strength to a lamination at low cost. It has excellent machinability. It is a strong and easily workable base for converting machinery as well as providing excellent machinability on high-speed, automatic forming, filling and sealing machinery. Its printing surface is good, making it ideal to carry messages as the outer ply in a lamination. Also, it is not subject to surface scuffing or marring on high-speed automatic packaging equipment.

Pouches are intended to stand alone as packages as well as to serve as inner or unit packs. Among the products currently using pouch paper as a laminate or coating base are coffee, fresh and instant; dehydrated soups, milk, potatoes and other instant foods; cake, ice cream and pudding mixes and other dried, powdered and concentrated foods; tobacco, detergents, pharmaceuticals, chemicals and also photographic materials.

Glassine and greaseproof

Glassine and greaseproof are two of the least expensive protective materials used in packaging today. This, together with their versatile properties, has given them very wide acceptance in the packaging industry.

Glassine and greaseproof papers are considered closely related papers in the packaging industry. Both are made grease and oil resistant in the fibre treatment and the paper formulation and processing as distinguished from greaseproofness obtained by after-treatment. Greaseproof paper is normally given a light calendering between iron rolls to obtain a smooth sheet. Glassine paper is a greaseproof stock that is supercalendered.

Both possess great adaptability and each exhibits properties of specific value for various end uses. They are closely identified with the packaging of food (85% of glassine and greaseproof is used in food packaging) and other products requiring greater protection and forceful merchandising.

Greaseproof and glassine can be readily "engineered" to perform a variety of packaging functions ranging from low-cost protection to the complex multifunctional performance achieved by the addition of specially formulated additive treatments—waxing, coating, lacquering, laminating and other converting methods. They can be plasticized to give the softness and toughness desired for modern high-speed packaging machinery. By further treatments and combinations, both papers can be made to seal with heat, provide wet strength and offer high resistance to water vapor.

Glassine and greaseproof papers are widely employed as wrappers, liners, bags within cartons, bag liners, overwraps, bags or envelopes and as a component or accessory material for applications in many fields. A partial list includes: the glassine cups for chocolates; the inner wraps for hams; the glassine bags for potato chips, salted peanuts and other snack foods; the inner and outer wraps for cookies and crackers; the waxed laminated glassine bags for prepared baking, pudding or ice-cream mixes; liners for coffee bags; the inner supplementary seal for soluble coffee packed in glass jars; the printed recipes on opaque glassine, inserted with prepared mixes.

Products that are important users include candy bars, cereals, cookies, crackers, prepared cake mixes, sugar, pharmaceuticals, hospital supplies, snack foods, meats, frozen foods, and industrial and military packaging. It



WAXED amber glassine inner liner. Moisture barrier retains crackers' crispness; grease resistance prevents shortening from staining carton. (*Glassine & Greaseproof Mfgrs. Assn. photo*)

will be noted that many of the products employing glassine or greaseproof have critical flavor problems, high water-vapor resistance requirements, grease- or oil-retention problems; or they call for sanitary, sterile protection. The papers fulfill these needs.

Greaseproof is widely used in the packaging of ham, bacon, veal, pork, sausage and similar foods which have high fat content.

Its density and "closed up" formation make it a good odor barrier and, therefore, it finds use in the packaging of coffee, soups and the like. It is employed for the packaging of butter, lard, oleomargarine, shortening and similar products, where both greaseproofness and its ability to hold out undesirable odors are valuable. Similar considerations in addition to obtaining greaseproofness in opaque or colored grades make it desirable for candy bars. When treated with special agents it is used as a release paper in the baking industry.

Since it is grease resistant and may be obtained with wet strength as well, it finds use with products that are greasy and high in moisture content.

Because of its ease of conversion it is often used in combination with other packaging materials to obtain desired effects at minimum cost. Greaseproof paper is laminated to paperboard to produce a greaseproof board used in a variety of trays and boxes for packaging products which contain a high fat or shortening content, such as bakery, brown-and-serve and meat products. It is often laminated to foil, kraft paper and films.

It can be made at any desired pH range and neutral greaseproof finds use as a noncorrosive wrap for metal parts that are covered with grease.

Like glassine, greaseproof paper has proved to be a packaging paper of great flexibility and economy. They both are normally sold in the weight range of 20 to 50 lbs. per ream.

Glassine is manufactured in various colors and degrees of opacity (by addition of fillers) for both aesthetic and practical reasons. Also, its nonabsorbent surface affords more "mileage" per pound of ink. Colored and opaque glassines, being more resistant to the transmission of ultraviolet light, have good anti-rancidity properties. Although conventionally made at pH values from 4.0 to 5.0, glassine paper can be made at a neutral pH and such paper finds its main use as a noncorrosive metal wrap. Glassine and greaseproof paper may be treated with water-repellent agents to retard penetration of liquids and provide good release properties. They also may incorporate various specific synthetic resins, such as urea-formaldehyde or melamine, to provide wet strength.

To obtain added strength and made-to-order protective water-vapor prop-

Glossary

Paper is usually specified according to basis weight. *Board* is specified by caliper (see definitions below). Distinction between paper and board is not exact. Anything less than 7 pt. is usually paper; anything over 20 pt. is board. The range in between varies. Usually anything between 7 pt. and 12 pt. is likely to be considered paper. One outstanding exception is 9-pt. corrugating material which is considered board.

Ream—number of sheets of paper for a given unit. In packaging papers there are either 500 sheets to a ream or 480 (see below under basis weight).

Basis weight—weight of five hundred 24 by 36-in. sheets of paper; or pounds per 3,000 sq. ft. of paper. For example, 60-lb. kraft paper is specified 60 lb. (24x36–500), or 500 (24x36)—60. This is a comparatively heavy stock. The 500(24x36) is generally standard in this country for most kinds of packaging paper. An exception is tissue which is calculated according to weight of 480 sheets of the same dimension. Tissue commonly ranges from 480(24x36)—7 to 480(24x36)—18. That is, tissue ranges from 7-lb. paper to 18-lb. paper, as a rule.

Caliper—thickness of material in thousandths of an inch (0.001 inch). A thousandth of an inch is called a point in reference to paperboard. Therefore a board that is 0.012 in. thick is called 12-pt. board. This measurement is satisfactory for board but it would be impractical for most paper grades. Film and foil thicknesses are referred to as gauge. Standard measurement is in thousandths of an inch, known as a mil. Film that gauges 0.001 in. is called one mil film. The reason a measurement as small as one mil or even half a mil can be safely used for film and foil is because the gauge is closely controlled during the manufacturing process. This minute control is not possible on paper-making machines. Therefore, paper is measured in terms of basis weight rather than points.

Other definitions*

Deciduous trees—refers to trees with short fibres. Broadleaf trees which shed their leaves in the fall of the year. Hardwood trees. Used in the soda and sulphate processes; coming into use for groundwood process. Aspen, basswood, birch, gum, maple, oak, and tulip poplar are examples of hardwood trees.

Coniferous trees—refers to trees with long fibres. Trees with needles. Softwood trees. Used in the kraft and sulphite processes. Pines and firs are examples of softwood trees.

Machine direction—parallel to the forward movement of the Fourdrinier wire, in connection with paper. Also called *with the grain*.

Cross direction—direction at right angle to machine direction.

Machine coating—accomplished halfway between drying operations (see "Outline of Paper Making," Paper Machine: dry end). Coating is mixture of clay and casein or starch. Clay gives the actual finish to paper, makes it smoother and less transparent; casein or starch is the adhesive which holds clay to paper. Paper that is to be printed may need another coating or coatings off machine.

Supercalenders—alternate steel and fibre (or paper) rollers, usually a stack of 14. Supercalendering may be done to give paper high gloss or a glazed surface. When greaseproof paper is supercalendered, its greaseproofness, density and transparency are increased to produce glassine.

* A complete explanation of paper terms is given in "The Dictionary of Paper," published under the auspices and direction of the American Paper and Pulp Assn.

erties, glassine is laminated to itself or other paper, films and foils. Thus, for economic reasons and efficient handling on automatic equipment, it is often necessary that the surface of packaging papers be plain and not coated. When low water-vapor permeability is required, it can be obtained by laminating two sheets of glassine with microcrystalline wax or with other types of laminants applied by hot-melt methods or by solvent application. Solvent application, for example, is the method generally used to combine foil to glassine.

The wax-laminated types of glassine have excellent flexibility and moldability--ideal for carton liners.

The ultimate in water-vapor protection is obtained through the use of a coated, laminated glassine. This surface coating may be paraffin wax or water-vapor barrier solvent coating.

Glassine, besides being of value as a wrap in itself, has the added feature of being an ideal paper to combine with films and foils, thus giving combined qualities having advantages not available in any single material. (See article on laminations, p. 149.)

The smooth surface, density and oil resistance of glassine permit the use of a number of surface coating materials with this type of paper. The coating types available include the hot-melt-applied paraffin waxes and derivatives as well as solvent-applied types made from cellulose nitrate, vinyl polymers and other synthetic or natural rubber polymers. (See article on p. 94.)

All glassine coatings of these types are used to add to the functional value of the paper. Moistureproofness and heat sealability are obtained and optical or physical surface properties, such as gloss, improved transparency or surface release, are plus factors which these coating materials add to the glassine.



PARCHMENT paper, heat-seal vegetable type, protects flavor of food and imparts none. Has high wet strength and grease resistance. (*Paterson Parchment photo*)

Coated glassines are widely used as overwraps or carton liners in the bakery and cereal industries. Potato chips and other snack foods are packaged in prefabricated or machine-made and filled bags of coated glassine. Soaps, detergents and metal parts are typical types of nonfood items packaged in coated glassine.

Although glassine and greaseproof papers are primarily a sulphite stock, varying percentages of sulphate pulp are incorporated with the sulphite to improve the strength characteristics of these papers. Improved coatings for glassine have been developed to enable the paper to be heat-sealed more readily on high-speed machinery.

Although a special paper stock is manufactured specifically for use as the base sheet in pouch packages, there also are many pouches that are made of glassine and film or foil. Wax-laminated glassine, coated with polyethylene, is formed into pouches for hair color rinse, for example. And foil-glassine pouches for pipe tobacco have provided function, economy and convenience. Moreover, automatic pouch-making, filling and sealing machines provide automatic, highly efficient packaging production (see p. 487). The glassine is a reverse-printed outer liner, and is particularly good for the outer ply because it is transparent, readily printable, easy to run on machinery and stands frequent handling.

Glassine is used in increasing quantities as the outside sheet of duplex cookie bags, to avoid wicking. Opaque grades, 45 to 50 lb., that print and function well, are available.

The smooth surface of glassine makes it suitable for metalizing. Protective properties of the material derive from the glassine; metalizing is strictly for the sake of appearance. The metalizing is achieved with a vacuum deposition of an aluminum coating only 0.000004 of an inch thick.

Vegetable parchment

Vegetable parchment is made by passing a sheet of waterleaf paper (an absorbent sulphate or sulphite sheet) through a sulphuric acid bath. This parchmentizing of the waterleaf makes the sheet thinner and more compact. It gains dry bursting strength, takes on high wet strength, and with increased tensility becomes grease resisting. The resulting material, called vegetable parchment (as distinguished from animal parchment), is therefore translucent, inert, grease and oil resistant, and is nonabsorbent as compared with waterleaf. It can be boiled without disintegrating or losing wet strength.

Basis weights range from 18 to 110 lbs., with the range from 27 to 60 lbs. the most common. Its pH range is normally from 5.5 to 7.0, but this can be altered by treatment with alkali or a suitable material during the parchmentizing operation. The basic sheet does not contain resins or sizings, is nontoxic, tasteless and odorless, and meets the requirements of the Food Additives Amendment to the Food, Drug & Cosmetic Act. It can be embossed or crinkled to provide stretch. Wax or coatings can be applied to add desired moistureproofness and heat sealing.

Vegetable parchment is a protective wrap for butter, margarine, meats, fish and moist food products, and is used as crate liners for fruits and vegetables. Specially treated parchment is now in general use in a wide field of industrial applications. It can be printed by either the offset, letterpress or flexographic processes with telling effects.

Waxed paper

The distinguishing thing about waxed paper is the coating rather than the paper. It can use any base sheet. Because of its large-volume use, no discussion of packaging papers would be complete without its inclusion.

A complete discussion of the kinds and methods of wax coatings is given in the article on functional coatings, p. 94. Briefly, the wax can be coated on the paper to remain on the surface (called wet waxed) or it can impregnate the paper stock (called dry wax because it is not waxy to the feel). It can impart high gloss to the packaging material or a dull finish, or barely change stock appearance at all.

The basis weight of the paper before waxing is usually from 9 to 40 lbs. Pulps are usually well beaten for greaseproofness and transparency and the fibres kept as long as possible for strength and resistance to tear. The waxed sheet can be almost transparent as is the case with some grades of waxed glassine potato chip bags, or it can be entirely opaque. It is used a

great deal in food packaging because it is tasteless, odorless, nontoxic, inert and can come in direct contact with the food as is the case with cracker and cereal waxed liners.

Waxed paper's chief assets for packaging are its protective and heat-seal qualities and low cost.

Wet waxed paper gives more protection, is more widely used, and is printed prior to waxing. Dry waxed can be printed after waxing.

Tissue paper

Tissue paper is used in packaging primarily as an inner wrap. Tissue has a basis weight range of from seven to 18 lbs., with most common weights being of 10, 12, and 15-lb. paper (wrapping grades 24 by 36–480; waxing grades 24 by 36–500). It is available in a wide range of colors.

The sheet surfaces of tissue may be hard or soft, may have various degrees of opacity or transparency and the fibre formation may be open (porous, absorbent paper) or closed (nonabsorbent). Tissue can be waxed or impregnated with resins or chemicals to impart wet strength, to inhibit tarnish or corrosion, fungus or bacteria growth. It may be given even strength in all wrapping directions; it may be formulated to spring back when crushed for cushioning purposes.

Tissue candy wraps impregnated with pure paraffin wax are strong and sanitary and will not stick. The wrap can be sealed by heat or simply twisted. Tissue also finds packaging uses as protective layer sheets between panes of glass, sheets of metal, rubber, plastics and other materials. It is also used as separators between materials in roll form such as linoleum, paper, rubber or plastic. Waxed interleaving tissues are also used between printed and lacquered surfaces. Highly polished surfaces of such items as kitchen pots, pans and other types of utensils are protected by tissue paper wraps. Treated kraft tissue is used to eliminate oxidation, tarnish or water stain from flat sheets of aluminum and other nonferrous metals. A special, dry waxed tissue that will not lint or stick to still-tacky, freshly painted surfaces saves high-speed operating costs.

Jewelers use tissue that inhibits tarnishing or corrosion and blue or black tissue for display of gold or silver jewelry, tableware, glassware, etc.

Outline of paper making

Although paper can be made from rags, straw, flax and several other materials, at least 90% of all paper uses wood and possibly all packaging papers use wood.

Therefore, only the wood-pulp processes are considered here.

Ingredients for paper making:

1. *Wood*–about 50% of wood is cellulose (fibrous part of the wood) and about 50% includes lignin (binder), carbohydrates, fats, gums, minerals, etc.
2. *Chemicals*–vary according to pulp desired (see below).
3. *Water.*

There are two classifications of pulp-making processes: mechanical and chemical. The main process in the mechanical classification produces groundwood. Chemical processes produce sulphate pulp, sulphite pulp, soda pulp and modifications of these three main pulp types.

Groundwood pulp–the fibres are separated from each other by pressing logs lengthwise against a grinding stone. This process does not use a digester and therefore the lignin and other materials remain in the pulp. Groundwood, alone, is not used in packaging papers; it is mixed with other pulps to impart smoothness to surface of sulphate or sulphite paper.

Sulphate pulp–commonly called kraft: wood chips are mixed with alkali (modification of soda with sodium sulphide) and cooked in digester. Both long and short fibered woods are used.

Sulphite pulp–wood chips are mixed with acid (calcium bi-sulphite solution) and cooked in digester. Both long and short fibered woods are used.

Soda pulp–chips are cooked with caustic soda in the digester. Short-fibered wood is used.

Other pulping processes include semi-chemical, chemical-groundwood, etc.

Following are brief descriptions of the major steps in chemical paper making:

Digester–wood chips (between ¼ and ¾ of an inch in length) are cooked with chemicals in digester. Primary function of digester is to separate cellulose from other elements of chips by cooking with chemicals. Cooking procedure can be varied to influence pulp strength.

Washing operations–remove cooking agent and lignin so that cellulose suspended in water can go to beater.

Bleacher–optional; bleaching improves appearance of paper by brightening but reduces strength to some extent. Pulp is washed again after bleaching.

Beater–Pulp is 97% water in the beater. Metal bars or knives rub against fibres. Sharp beater knives make absorptive papers. Prolonged beating with dull knives causes a gelatinization or hydration by bruising–makes a dense paper that is nonabsorptive. Dye, size and/or filler is added to pulp in the beater. Sizing retards penetration of water through the paper and prevents fuzzing of paper; it also makes paper stiffer. Filler may be mineral filler or may be other wood pulps. Mineral filler brightens paper, improves opacity, fills up pores, softens paper. Groundwood or soda pulp may be added for surface smoothness or uniformity.

Refiner–Extension of beater processing. Groundwood, soda or other pulps may be added at refiner rather than at beater.

Headbox–Pulp is about 99.5% water and 0.5% cellulose fibre. Pulp, or stuff, is fed on to *Fourdrinier wire* or *cylinder* from the headbox. Stock flows onto the wire at a controlled rate–velocity, amount and consistency controlled to produce a certain thickness of paper.

Paper machine: wet end–stock begins to take form of paper sheet. On Fourdrinier machine, a fine mesh wire belt suspends pulp and lets water drain off. As wire moves and water drains off, fibres suspended on wire mesh belt begin to felt together to form paper sheet. Wire speed and actual amount of stuff (governed by rate of flow from headbox) determines paper weight. The forward movement and some movement from side to side of the Fourdrinier wire determines formation pattern of the paper. Water is removed from pulp; by draining, then by suction applied through suction boxes over which wire travels.

Cylinder machine–may be used instead of Fourdrinier wire for making tissue paper and some board grades. Cylinder machine consists of large cylinders which rotate in vats of pulp. The pulp fibres are formed into a sheet on the cylinder. A multi-cylinder machine may have two or more cylinders in separate vats of pulp. Each vat may have same pulp or different pulps. In this operation the wet sheet is couched onto the second cylinder from the first, onto the third cylinder from the second and so on. This permits wide variation in thickness or weight of finished sheet and a variation in the kind of stock used for the different layers of the sheet.

Paper machine: dry end–as the delicate web of paper, still quite wet, comes off the Fourdrinier wire, or the cylinder, it is fed through the press section. Here, compactness or density of the paper is determined to some extent. Then the web goes through a series of internally heated iron rollers, about 4 ft. in diameter.

Yankee machine–uses one large (9 to 15 ft. in diameter) drying cylinder instead of several smaller ones for drying sheet. It may have a cylinder or a Fourdrinier wet end, and any number of presses or auxiliary driers of the usual type.

Calender–a vertical bank of iron rolls. Paper passed through part or all of a series of the rollers for added smoothness.

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Gown by Oleg Cassini

Your product's picture will have true appetite appeal when printed on new Crossett Coated Food Board. Multi-stage coating on our cylinder machine is the reason. Superb printing surface is achieved by the building up of coating materials in a series of applications that results in uniform coverage.

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PROPERTIES OF PACKAGING PAPERS

	PROPERTIES	Glassine, plain	Glassine, lacquered	Glassine, waxed	Glassine, laminated	Greaseproof paper
GENERAL						
1.	Type of material	Supercalendered dense paper from highly refined special pulp	Resinous-coated glassine (heat sealable)	Waxy coatings on glassine	Multiple-ply glassine, waxy laminant	Dense paper from hydrated pulp. Not supercalendered.
2.	Forms available	Sheets, rolls	Sheets, rolls	Sheets, rolls	Sheets, rolls	Sheets, rolls
3.	Clarity	Transparent to opaque	Transparent to opaque	Transparent to opaque	Translucent to opaque	Translucent to opaque
4.	Thickness range, in.	0.00075 to 0.003	0.00085 to 0.003	0.0009 to 0.003	0.0025 and up	0.001 to 0.004
5.	Basis weight, lb.[1]	14 to 60	23 to 45	23 to 65	40 and up	14 to 60
6.	Yield, sq. in./lb.	7,200 to 30,857	9,600 to 18,782	6,600 to 18,782	10,800 and less	7,200 to 30,857
PHYSICAL						
7.	Tensile strength, lb./width	15 and up	25 and up	25 and up	40 and up	10 and up
8.	Elongation, %	2 to 8%[5]	2 to 8%[5]	2 to 8%[5]	2 to 8%[5]	3 to 6%[5]
9.	Bursting strength (Mullen), lb./sq. in.	50% or more of basis weight	50% or more of basis weight	50% or more of basis weight	50% or more of basis weight	50% or more of basis weight
10.	Tearing strength (Elmendorf), gm.	Better than 50% of basis weight	Better than 50% of basis weight	Better than 50% of basis weight	Better than 50% of basis weight	Better than 50% of basis weight
CHEMICAL						
11.	Water-vapor permeability, gm./24 hr./100 sq. in. at 100° F., 90% R.H.	High	0.2 and up	0.2 and up	0.3 and up[2]	High
12.	Resistance to flavors, odors, gases	Good	Very good	Very good	Very good	Fair
13.	Resistance to mild acids, alkalies	Good	Good	Good	Good	Good
14.	Resistance to greases and oils	Very good	Excellent	Very good	Excellent	Very good
PERMANENCE						
15.	Resistance to heat (limiting temperature), ° F.	Up to 250	150	120	120	Up to 250
16.	Resistance to cold (limiting temperature), ° F.	Depends on use of plasticizer	Depends on use of plasticizer	Depends on use of plasticizer	Depends on use of plasticizer	Depends on use of plasticizer
17.	Dimensional change at high R. H., %	High	Moderate	Moderate	High	High
18.	Aging characteristics	Good	Good	Good	Good	Good
CONVERTING AND USE CHARACTERISTICS						
19.	General machine performance	Good	Good	Good	Good	Good
20.	Special functional or use features	Grease resistance	Transparency and moisture-proofness	Moisture-proofness	Moisture and grease resistance	Grease resistance
21.	Sealing considerations	Adhesive required	Heat sealable	Heat sealable Low strength seals	Adhesive required	Adhesive required

1 Based on a ream of 500 sheets, 24 by 36 in., or 3,000 sq. ft. 2 Depending on number of plies and laminant. 3 Yield depends on paper and weight of coating. 4 Also special treatments to accept adhesives systems. 5 Depending on plasticizer content.

Representative types are shown here. For other types, grades and treatments see articles included in this section. (Charts on films and foils appear in Section 4.) See also advertisements in this section for news of various papers and new developments. Also consult Buyers' Directory at the back of this book for a complete list of types of packaging papers, laminations, coatings and the like.

Kraft, plain	Extensible paper	Pouch paper	Polyethylene-coated paper	Parchment, vegetable	Waxed paper	
Paper from sulphate pulp	Unbleached kraft	Supercalendered, dense, opaque, bleached kraft	Kraft paper with polyethylene coating (heat sealable)	Acid-treated cellulose	Thin calendered paper with waxy coating	1.
Sheets, rolls	Rolls	Sheets, rolls	Sheets, rolls	Sheets, rolls	Sheets, rolls	2.
Opaque	Opaque	Opaque	Opaque	Translucent to opaque	Transparent to opaque	3.
0.002 to 0.009	0.0025 to 0.011	0.0012 to 0.004	0.002 to 0.030	0.0017 to 0.0065 (single)	0.002 to 0.008	4.
20 to 100	30 to 100	20 to 60	Nearly any weight can be obtained	18 to 110	22 to 100	5.
4,320 to 21,600	—	7,200 to 21,600	—[3]	3,927 to 24,000	4,000 to 20,000	6.
MD, 60-80; CD, 30-40 (% b.w.)	Lower than regular kraft	20 and up	To 10% increase over base kraft	High wet strength	10 and up	7.
1.5% MD 3.0% CD	MD 9%+ CD 4%+	3 to 8%[5]	2 to 5%	MD, 2 to 4% CD, 4 to 15%	2 to 5%	8.
70% or more of basis weight	Equal to regular kraft	60% or more of basis weight	To 10% increase over base kraft	13 to 65 dry; good values wet	50% or more of basis weight	9.
2-2.5 gm./lb. of basis weight	Higher than regular kraft	Better than 75% of basis weight	To 20% increase over base kraft	Sulphites, 60-80% of b.w. Sulphates, 100-130% of b.w.	1.5 gm./lb. of basis weight	10.
High	High	High	0.3 and up	High if not specially treated	0.3 or more	11.
Poor	Poor	Poor	Fair	Good	Poor	12.
Poor	Poor	Good	Excellent	Good	Good	13.
Poor	Poor	Poor	Fair	Fair to excellent	Poor	14.
300	250 when dry; any temperature, wet	Up to 250	200	200 when dry; any temperature, wet	100 to 120	15.
Very low limiting temperature	Excellent	Depends on use of plasticizer	—65	Depends on use of plasticizer	0	16.
Moderate	Moderate	High	Moderate (curls)	Amount of change depends on type	Moderate	17.
Good	Good	Good	Good	Good	Good	18.
Excellent	Good	Good	Good	Good	Good	19.
Strength and economical cost	Impact resistance	Excellent for coatings, printing	Moisture resistance; moderate grease resistance	Grease resistance and wet strength	Moisture-proofness	20.
Pasted or sewn	Pasted or sewn	Adhesive required	Heat sealable[4]	Adhesive required	Heat sealable Low strength seals	21.

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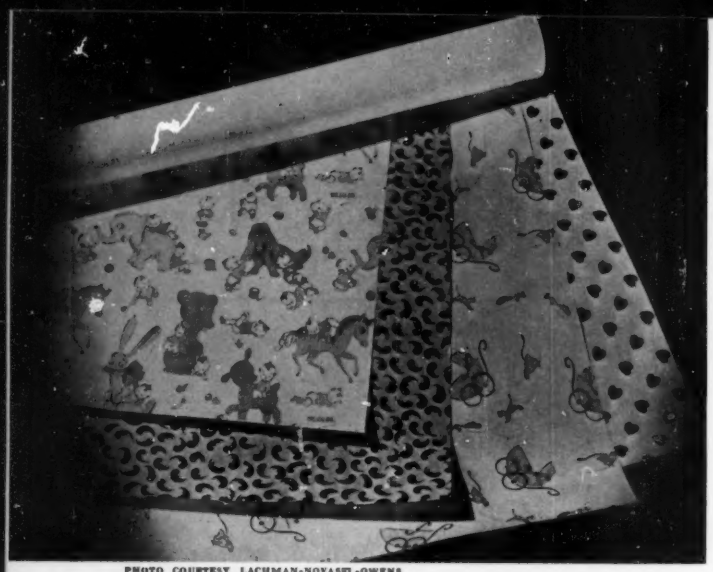


PHOTO COURTESY LACHMAN-NOVASEL-OWENS

FANCY PAPERS—types and uses

One of the most familiar uses of fancy papers is for wrapping of gifts. And interest in such papers is increasing with the trend toward supplying gift products pre-wrapped. However, so versatile have these papers become that they are also used for packaging every-day items to convey such messages as convenience, distinction, luxury or association with a particular mood or purpose. Most often fancy papers serve to upgrade an article or to lend an air of novelty or extra quality.

Because of the easy adaptability of paper, the marketer or packager can either subtly or boldly convey impressions about the purpose of the product it wraps such as high fashion, homespun virtue, elegance, durability and the like. Fancy papers are a relatively low cost medium for providing sales appeal that can come through as background emphasis. A panoramic selection of textures, colors and special effects is available. Paper can simulate lace, wood, fabric, leather, straw, metal. It can be plain or patterned, dull or shiny, smooth or rough surfaced.

In addition to the primary purpose of decoration, fancy papers are often designed to provide protective properties—such as grease and moisture resistance and protection against discoloration and tarnish. This and similar combinations of functions are used to advantage in packaging jewelry, food specialties, confections, cosmetics and all kinds of gift items.

Decorative papers are produced by giving a finishing treatment or combination of treatments to base stock. The raw stock may be any combination of mechanical and chemical wood pulp, or wood pulps alone produced by any process. When paper is to be coated, it is beaten and hydrated more than an antique paper, for example, to obtain formation smoothness and firmness. When sizing is used in the beater it is to make the paper somewhat water repellent so water will not cause the paper to wrinkle. Surface sizing provides an outside binder that holds fibres down, prevents fuzz and holds offset ink on the surface.

The color of the base stock is important only when there is a coating of transparent films or when color is needed for some special effect. Color stock may be specified to prolong shelf life if frequent scuffing or hard usage is anticipated. Varnish or clear vinyl often is applied to such paper.

Fancy papers can be classified according to base stock and/or finishing treatments. The charts on pages 87 and 88 list the most popular of these papers and provide some basic information about their formulation, chief characteristics and typical uses.

In addition to those included in the charts, there are other special papers which fall into the category of fancy papers.

The various printing methods use papers which have a special surface to accommodate the process. (For processes, see page 621.) Ink for fancy papers may be water color or oil but is usually lacquer.

Embossed papers have a pattern in relief, either raised or depressed. Many patterns are produced—basket weave, leather grains, swirl, pebbled, mosaics, moire, and the like. They are produced in various ways:

1. *Regular.* An embossing machine with a steel-engraved roll and a paper impression roll which runs in register with it presses the design into plain or coated paper in any finish so that it shows in relief on the reverse side.

2. *Friction embossed.* The pattern is pressed against a smooth, gearless roller. Friction is produced by the operation of cold and hot pattern rollers, the latter being cored for steam in contact with the pattern. The combination of pressure and friction causes a deepening color in the area of the pattern.

3. *Print embossed.* Color is applied to the depth of the design by running an ink roll in contact with the raised portions of the steel embossing roll.

4. *Two-toned embossing.* Contact

RAISED DESIGNS (example shown magnified) on new thermographed paper for decorative boxes, gift wraps. Printed on continuous rolls, in metallics, flitters, colored raising powders. Wording or private design can be similarly printed. (*Rayz-Brite papers by Embossograph Process Co.*)



Papers used in gift, luxury and fancy packaging*

Type	*Base stock and process*	*Characteristics*	*Typical uses*
Flat or dull finish			
Uncoated	This paper, usually a sulphite sheet, is given special finish. Surface is ready for printing.	Antique or matte finish. Deep, rich colors. May scuff readily.	Box coverings, labels, inserts, overwraps, displays. Lining of platforms. For cosmetics, jewelry, etc.
Coated	Casein-, starch- and clay-coated, made with brush or roll coater or on brushless coater.	Soft, rich effects. Has slight sheen. May scuff readily.	
Glassine	Plain glassine, beaten and supercalendered.	High gloss and transparency.	Decorative, functional, protective, grease-resistant.
	Glassines supercalendered and steam treated.	Gloss and whiteness.	
Glossy coated			
Brush finish	Creamy coating flowed onto web; distributed by series of brushes. Calendered for polish.	Will print fine halftones—up to 133 line.	Labels. Fine printing.
Plate	Coated paper, smoothed by cold rolls. Sometimes steam treated for high finish.	Smooth finish; slight sheen. Wide color range. Fair scuff resistance.	Box wraps, labels. Excellent printing surface.
Friction glaze	Sulphite and groundwood stock. After coating, sheet is friction polished between heated steel roll and compressed cotton roll.	Wide color range. High glaze. Some texturing. Good scuff resistance. Economical.	Box coverings, labels. Good appearance at low cost. Men's hosiery boxes. Toys.
Mica	Paper is coated with ground mica crystals in vehicle of casein, gum or starch sizing.	Sparkling, glinting surface.	Box coverings, linings, labels —cosmetics, jewelry.
Flint	Beater-dyed, sulphite, groundwood or special stocks; coated. Highly polished by rubbing with flint stones.	Extremely fine quality surface; high gloss. Wide color range. High scuff and soil resistance.	Box coverings, labels, fancy wraps—quality products: cosmetics, jewelry.
Waterproof	Beater-dyed or sulphite stocks; coated. Top surfaced with waterproof materials such as casein, gums; or sized.	Protective as well as attractive. Wide color range. Strong and durable.	Box coverings, labels. "Masculine" effects. Can simulate leathers, pebbled-texture.
Metallic			
Casein	Sulphite and groundwood base stocks. Bronze, aluminum, copper ground into gum vehicle; coated on sheet. Calendered.	Metallic tones. Smooth, matte, printable finish. Excellent scuff resistance. Economical.	Box wraps, display labels, edgings, linings, platforms. Gift wrappings. For cosmetics, candy.
Gravure printed	Sulphite base stock. Gravure printed with metallic powder mixed with lacquer.	Metallic tones. Smooth, matte, printable finish.	
Pyroxylin	Bronze, aluminum, copper ground into pyroxylin lacquer; coated on paper; calendered.	Metallic tones. Wide color range; several weights. Rich, elegant.	Box coverings. Food wrappers. For high quality items.
Half-fine	Patches of thin copper or aluminum alloy overlapped on adhesive-coated paper.	Continuous metallic surface. Wide color range. Elegant, rich.	Specialty box coverings, overwraps. For cosmetics, expensive jewelry.
Half-fine embossed	Embossed metal foil laminated to sulphite or groundwood backing.	Embossed most widely used half-fine type; less costly.	
Argentine	Glaze of argentine (precipitate of tin) polished to bright silver with friction calender. Lacquer lends gold or colored-metallic look.	Has decorative effect of foil and can be used as substitute for it; is less costly.	Box wraps and overwraps. For gift packages and luxury items.
Foil	Metal foil applied to paper backing with bonding adhesive. Aluminum used mostly.	Decorative—functional. Wide range of colors. Brilliant.	Labels, seals. Food, tobacco, etc.
Vacuum metalized	Produced by vacuum, metal-vapor deposit method; sulphite base stock, glassine, etc. No increase in basis weight of base stock.	Ease of printing, handling. Decorative. Non-conductor (important for items like batteries).	Wrappers for ice cream bars. Labels for canned goods.
Iridescent or pearlescent coated	Made with pyroxylin lacquers. Crystallizing material dissolved in nitrocellulose vehicle.	Mother-of-pearl effect. Strong, durable sheet.	Box wraps, overwraps. Gift packages, luxury items.
Cast-coated	Plastic coating applied in aqueous state to paper. Coating finished by contact with highly polished chromium-plated steel drum.	Smooth, high gloss. Brilliant white and colors. Good printing qualities. Good scuff resistance.	Box wraps, labels. Folding cartons. Displays. Gift wraps.
"Glitter"	Specks of metal embedded in paper surface, either all over or on printed design on paper.	Attention attracting. Pleasing patterns of metallic flecks.	Box coverings. Displays. Creates impulse buying.
Flock	Flock of cotton, wool or rayon is adhered to surface of paper pre-coated with adhesive.	Soft, velvety, luxurious. Rich color; also contrasting shades.	Coverings, linings for gift boxes, silver chests, etc.

* See also chart on next page.

Tissues used in gift, luxury and fancy packaging*

Type	*Base stock and process*	*Characteristics*	*Typical uses*
***Anti-Tarnish* Jeweler's**	White stock; .0008% sulphur or less; pH 6.5 to 7.5. Higher grade pulp than No. 1 white.	Product-discoloration prevention.	Wraps and liners. For silver, gifts.
Kraft	Not more than .0008% sulphur, pH 6.5 to 7.5.	Same color as kraft wrapping paper.	Wraps for hardware, tools, instruments.
Fruit	Usually 12- to 18-lb. stock. A little oil or preservative may be added for fruit shipping.	Offers long shelf life, enhances eye appeal, of fresh product.	Wraps for fruits; wrappers for identity.
Florist	12-lb. sheet of medium grade No. 1 white tissue. Also waxed, in green.	Protective, water-resistant.	Wraps for blooms. Waxed green for liners.
Twist	Kraft-base stock. Occasionally, watermarked tissue base stock. Usually printed with special design of advertising copy.	Good twisting strength. Keeps bottles clean during shipment.	Wraps for wine, whiskey, other liquor bottles.
Hosiery	Coated or uncoated tissue.	Coated takes very fine printing, has superior texture and feel.	Inner wraps for hosiery, other textiles.

*See also article on tissue paper, p. 82.

of heated steel embossing roll with unmated paper roll produces a slight discoloration which creates a two-toned effect.

5. *Spanished.* Color is applied to the entire surface of the sheet and then scraped off with a dressed blade. This leaves varied tones of coloring on the sheet, the shade depending on depth of the embossing.

Simulations. When one considers the variety of colors, textures, weights and special treatments possible in decorative papers, it is not surprising that they are manufactured to simulate a great number of natural and fabricated materials. Various types of coating and embossing are employed to imitate textiles of all kinds so effectively the paper products look and even feel like their models. Among these simulated effects are tapestry, flowered cretonne, watered silk, chintz, velvet, burlap and linen. There are wood and wicker types in shiny and dull finishes, from white knotty pine to African oak, available in a number of weights. Leather effects imitate fine pin seal and whorl-marked ostrich hide; reptile patterns are made in a variety of colors.

Dozens of other materials are simulated. Stucco and pebbled effects are produced, together with every kind of marble finish. Also tile, linoleum and similar patterns are imitated.

Private designs

Instead of using a standard fancy paper for liners, wrappers and coverings, many packagers are now interested in papers which drive home a sales message in conjunction with their advertising. Liners and coverings of a package can be made to sell product, brand, manufacturer or retailer when other sales devices are not operating. For this purpose, custom designs and styling come into their own.

Probably the largest bulk consumers of private-design papers are department, chain and specialty stores. Many have built entire promotions around them.

Frequently, but not invariably, private designs incorporate the company name or identifying trademark. Sometimes, particularly in the case of gift papers, a merchandiser depends on his striking motif to make in the consumer's mind an association with his product.

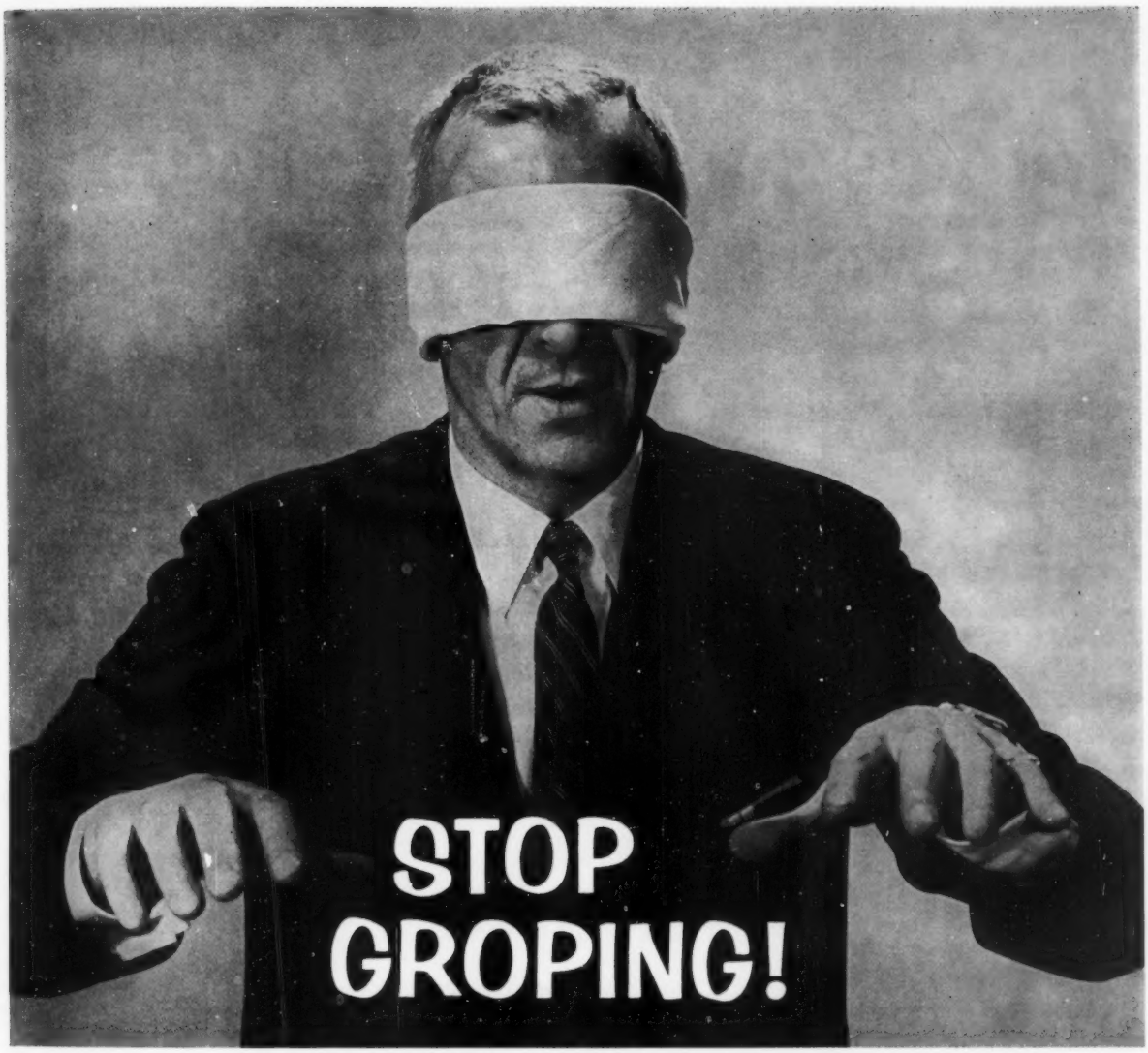
The cost of a private design is a factor to be considered. Recent efforts of the paper converters have brought these papers within reach of many new customers. Some users report that one-color printing on the tissue they use adds from 10 to 25% to the cost of the stock, which sounds high until the low unit cost of the paper is taken into consideration,

A private-design program may be started on a partial basis. For example it could begin with the inside tissue and later be carried out on the outside wrap, or a different sequence of extension could be planned.

A private design should, of course, be considered in the light of its advertising advantages plus the fact that it often costs no more than the lowest-cost coverings available.

CUSTOM-STYLED, decorated wrapping papers are created for many users of fancy papers. Seasonal appeal is combined with special designs and identification. (*Thilmany photo*)





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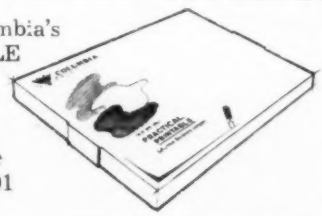
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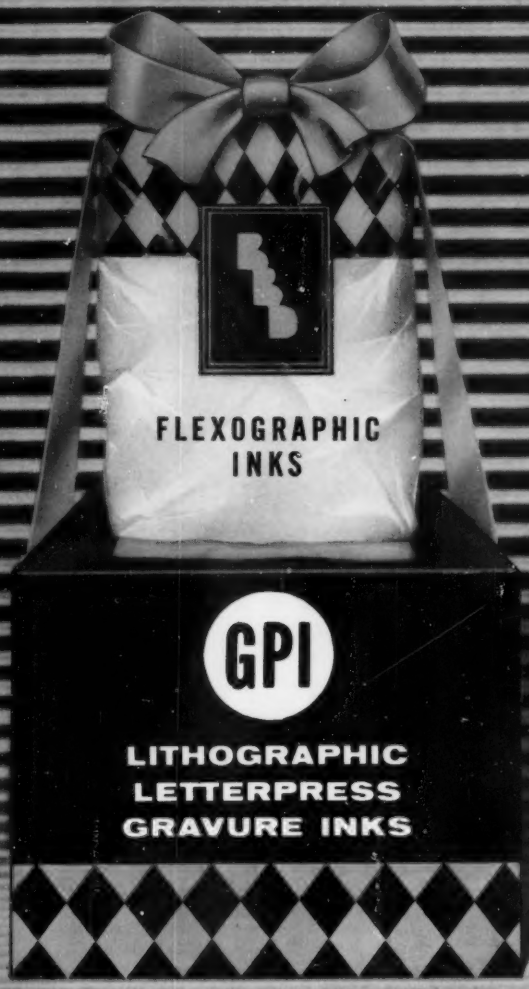
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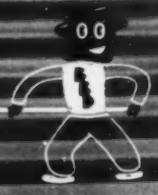
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BOXBOARDS—for adaptability, economy

by Glen T. Renegar*

The basic material for the most extensively used types of containers found in the packaging field is, logically, boxboard. Each year, well over a hundred billion folding cartons, cards for carded merchandise and many types of partitions and platforms, plus upwards of five billion set-up boxes, are made from boxboard.

These containers and components have gained and hold their acceptance because boxboard offers some very important advantages: the raw materials are abundant and readily available; the finished stock is economical; mass production and precision fabrication are achieved in various phases of manufacture and use; and research and technological progress keep boxboards abreast of the packager's many new demands for better function and improved appearance.

Glossary of terms

Before discussing boxboard manufacture and several of the most widely used types of board, it may be helpful to define some of the terms in the industry's vocabulary. (See also p. 80.)

Top liner. Outside of the carton composed of the highest quality pulps for bender and excellent printing surface.

Under liner. Thin ply directly under top liner is used to give good background for top liner. Usually composed of high-grade white waste paper.

Back liner. Inside of carton and may vary in quality depending upon customer requirements.

Filler. Paper stock used to give body and thickness to the sheet and is composed of waste paper.

Grain. The direction in which most of the boxboard fibres are formed on the paper-making machine.

Dimensions. The dimensions of a sheet of boxboard are given "cross grain" first, then "with the grain"; thus, in a sheet 25 in. by 40 in., 25 in. is the cross grain direction.

Finish. Denotes smoothness of sheets, there being four standard degrees, with the fourth having the smoothest finish.

The complex technical procedures involved in the manufacture of folding boxboard need not be detailed in this article. However, it may be said that boxboard is produced by two methods on two entirely different types of machines.

Fourdrinier machine (see also p. 82). This unit produces low caliper board at high speed.

Cylinder machine (see also p. 82). A type of machine which joins several (2 to 10) thin plies of various types of raw materials on individual wire-covered rotating cylinders and then wet bonds the plies into a single finished boxboard sheet.

Economical raw materials can be used in the under liner. By varying the raw materials in the intermediate plies or coloring the stock during the manufacturing process, many types and grades of boxboard may be made.

The top liner of a boxboard stock —the portion of the carton normally on exhibit—is traditionally made of the the best and whitest materials. Other qualities built into boxboard used in the fabrication of folding cartons include strength for product protection, ample bending characteristics (in some cases as much as 180 deg.), and a surface suitable for fine printing.

Types of cylinder board

The variety of cylinder boxboards available is sufficient to meet any manufacturer's folding carton requirements. Here are brief descriptions of some of those most commonly used. (See also chart, p. 93.) The higher grades include bleached manila, white patent-coated, extra-strength and clay-coated boxboards.

Bleached manila. This stock is white, with a top liner of bleached sulphite, unbleached sulphite and groundwood. It can be treated to take multicolor printing and is used for many different types and sizes of folding cartons.

White patent-coated. Probably the most widely used of all types of folding box board. Bleached pulp is used for the top liner. This grade takes all types of printing, including glossy inks and overprint varnish.

Extra-strength. A fairly recent development, this boxboard is widely used for hardware boxes, bottle carriers and for many other items requiring unusual carton strength and ruggedness. The plain, kraft type is brown. For white grades, the top liner is made of semi-bleached or bleached kraft; the filler, of corrugated cuttings; the back liner, of kraft cuttings. This grade performs well on high-speed packaging machinery and is suitable for printing by all methods, with lithography being indicated where fine detail and screen work are required.

Clay-coated boxboards. These boards are used for the highest quality folding cartons. The composition of the board itself is the same as that of white patent-coated. The clay coating evens out the irregularities occurring in most boxboards. The most common pigments used for making clay-coated board are clay, calcium carbonate and titanium, applied with adhesives and various other agents. Special metallic coatings can give gold, silver and copper effects. Coating formulas are vital in producing this high-grade board and are among the most zealously guarded secrets in the paper industry. This board can be prepared to take all types of printing, lacquers and varnishes.

Lower grade boards include chipboards, single manila and special types, described as follows.

Chipboard, solid newsboard. The former is made of mixed paper stock; the latter of old newspapers. Both are used chiefly for set-up boxes (candy, textiles, stationery, etc.). Printability is not required and bending would be a liability. The stock can be lined with decorative paper, cloth or other flexible materials.

Plain bending chipboards. One side has bending qualities. Cartons made of this board are used primarily for such items as shipping sleeves, cigarettes, laundry boxes, medical supplies, and the like.

Single manila. Identified by its buff or cream color. Widely used for bakery products. Single manila is unsuited to multicolor printing or intricate carton designs.

Special types. Solid bleached sulphate board. Made entirely of virgin

*Production Manager, Paper Mills, Container Corp. of America, Philadelphia.

sulphate pulps and used for foods—ice cream, frozen foods, baked goods and other perishables. This is usually a Fourdrinier board.

What the mill must know

There is no such thing as an all-purpose boxboard. Consequently, if an order for folding boxboard is to be filled satisfactorily, the mill *must* have the following information:

Type of product to be packaged.

Grade of board required. Specific grade; plus weight per 1,000 sq. ft.; whether special top, back or filler is required, etc.

Printing (offset lithography, letterpress, rotogravure).

Number of colors.

Style of carton. Special features (panels, windows, special scoring, etc.); method of gluing (in customer's plant?); processing of board (Kliklok machine, double package maker, Brightwood gluer).

Special treatments

Boxboards can be adapted to a very wide range of specific requirements by (1) special processing or physical treatment; (2) special formulation including the addition of chemicals; (3) coatings and (4) laminations.

Anti-tarnish. Materials for board stocks can be so selected and treated that the finished board will not contribute to tarnishing of silverware, instruments and the like. These boards do not protect products against tarnish; they simply do not contribute to it. Care must be taken not to select inks, adhesives or other materials that might cause tarnish.

Curl resistance. Boards can be treated or fabricated to reduce the problem of curl and thus contribute to faster, better handling on high-speed printing and packaging units.

Coatings. One of the most practical, versatile and economic ways to adapt board for special functional characteristics is by means of coatings. (See article on functional coatings, p. 94.) Coatings include waxes, inks, varnishes and synthetic resins and provide almost any characteristic a packager might desire—resistance to grease, moisture or attack by chemicals: flexibility; extra strength; heat sealability and the like.

There are a number of new developments where coated boards are concerned.[1] For example, on-machine coatings applied during manufacture of bleached board give packagers a selection of dazzling new printing surfaces and improved barrier qualities that widen applications for both food and nonfood products.

Laminations. Not only can sheets of boxboard be laminated together to provide greater strength and stiffness, but functional and decorative characteristics can be added by laminating special papers or foil to the board. Foil, for example, provides excellent barrier properties against moisture, grease and foreign materials. In addition, foil is reflective and can contribute insulating properties to the package. Laminations, of course, enhance the versatility of board stocks, but do not give board stocks properties such as wet strength or water-vapor barrier resistance which they did not have in the beginning. In such cases special consideration must be given to the base stock as well as to the coating or laminate to be used. There are a number of boards that are designed to give water-vapor resistance.

Sizing. Materials such as alum, resin or starch can be added to pulp or can be coated on board to provide stiffness, grease resistance, printability, water repellency or similar characteristics.

Other treatments. Boxboard can be made to resist mold, repel insects, inhibit corrosion, retard the development of rancidity, withstand steam sterilization without losing brightness and meet other special requirements. For example, boards can be laminated to a paper impregnated with a volatile corrosion inhibitor to solve corrosion problems.

[1] See "Frozen-Food Single Wall," MODERN PACKAGING, Dec., 1960, p. 96; "Approaching the Single Wall," MODERN PACKAGING, March, 1960, p. 143; "Antioxidant Effect in Boxboard," MODERN PACKAGING, May, 1959, p. 111.

Special food boards

by George E. Oakley, Jr.*

Special food board for packaging moist, liquid or oily foods is available in two types: *full chemical pulpboard* made of not less than 85% chemical wood pulp; and *chemical and groundwood pulpboard* made of a combination of less than 85% chemical wood pulp, plus groundwood pulp or equivalent fibrous material. Each has some of the following normal properties: liquid, moisture or vapor resistance; good bending qualities; extra strength. They also may be hard-sized with a surface suitable for color printing. Both are produced under sanitary conditions so that the paperboard may be used for direct contact with foods. Bleached board, tested on a General Electric Brightness Meter, has brightnesses from 50 to 65; full bleached has brightnesses from 66 to 78; super-bleached or pigmented has brightnesses over 78.

Food containers that are made with *full chemical pulpboard* which is moisture resistant and normally has good bender include: milk containers (also used for fruit juices) which are also either waxed, coated or otherwise treated; frozen-food containers which are usually waxed; heavyweight cups which may possess only adequate bender for folding, bending or crimping during fabrication; and round, nested containers.

Food containers that are made with either *full chemical pulpboard* or *chemical and groundwood pulpboard* which is moisture resistant include: paraffin cartons for butter, lard, oleomargarine, shortening and ice cream, which also are usually hard-sized and have good bending qualities; paperboard pails which also are rigid and are good benders; lids which use rigid stock; liquid-tight containers and lids (usually spiral-wound cylinders with slip-on lids) made with tough, rigid board; milk bottle hoods and cover caps which must have good forming qualities; plates, dishes or trays which must be rigid but also have necessary forming qualities.

Milk bottle plugs which are normally paraffined and made with rigid board use moisture-resistant *chemical and groundwood pulpboard.*

Bacon dividers, meat pads, separator stock, layers, nestings and the like are necessarily of many types and thicknesses and range from low brightnesses to super-bleached and pigmented boards.

Bakery packages for retail sale of products such as crackers, cookies, cakes, pies, doughnuts, sweet rolls and breads use bleached board with or without laminated moisture- and grease-resistant liners. This board has good bending qualities and good multicolor printing surface, and is resistant to the penetration of grease and moisture.

Paperboard for multipack carriers is bleached, full-bleached or super-bleached; has good bending qualities; is rigid, and has a surface suitable for multicolor printing.

*Manager, Paperboard Sales, Riegel Paper Corp., New York City.

Boxboards used in packaging: types, uses, characteristics*

Grade of board	*Uses*	*Contents*	*Caliper ranges*	*Chief characteristics*	*Finish in points*[1]	*Brightness*[2] *standard*
Plain chipboard Solid newsboard News vat-lined chip Filled news	Primarily in the manufacture of set-up boxes for candy, stationery, textiles, gifts, etc.	100% low-grade waste papers (news, mixed to corrugated).	0.020 to 0.060	Lowest-cost board produced. Adaptable to special lining papers. Not good for printing. Color range from light gray to tan. Poor bending qualities.[3]	2,200 to 2,400	No standard
White wood vat-lined chipboard	A higher grade set-up box with a white liner.	White liner is 100% groundwood. Back is same as chipboard.	0.020 to 0.060	The chief difference between this and plain chipboard is that it has a white liner adaptable to color and can be sized for printing. Poor bending qualities.	2,100 to 2,400	55
Bending chip	Boxes for packaging light items, such as cigarettes, toiletries, pastry, medical supplies; suit boxes.	100% waste papers of the low grades (news, mixed, corrugated).	0.016 to 0.034	Lowest-cost[4] board for folding boxes. Usually gray or light tan but can be printed with all colors. Adaptable to special sizing and calendering. Excellent bending qualities.	1,800 to 2,100	No standard
Colored manila-lined bending chip	Same type of packaging as bending, where more eye appeal is desired.	Top liner is virgin pulps or high-grade waste-paper substitutes, some groundwood. Back same as bending chip.	0.016 to 0.034	Same as bending chip, except for brighter liner. Very even colors on liner; back usually same as bending chip. Has excellent bending qualities.	1,800 to 2,000	Varies with color
Bleached manila-lined bending chip	Packaging products where more eye appeal is desired using two- and three-color print jobs.	Top liner is high-grade waste, virgin sulphite pulp, some groundwood. Back is usually news or chip.	0.016 to 0.034	Same as bending chip except white top liner permits special treatment and multicolor printing. Excellent bending qualities.	1,800 to 2,000	58 to 60
White patent-coated newsback	Folding boxes, displays, posters, shirt and textile inserts, collars, sleeves, etc.	Top liner is 100% virgin pulps and high-grade wastes. Free of groundwood.	0.016 to 0.034	A smooth board, much whiter than any of the above grades. Colors are not subject to fading and it has considerable strength. Back usually gray. Excellent bending qualities.	1,700 to 1,900	65
Clay-coated board	Boxes or display pieces wherever extremely high-grade, multicolor printing is needed.	Same as white patent-coated newsback except for clay-coated surface.	0.016 to 0.024	A very smooth and white board providing an excellent printing surface. Top is white, back ranges from manila to gray, depending on grade. Excellent bending.	1,700 to 1,900	70 to 80
Solid bleached sulphate board	Foodstuffs – bakery boards, ice-cream board, frozen foods.	100% virgin sulphate pulps.	0.012 to 0.026	A strong board used in folding boxes where strength and good performance on automatic filling machines are needed. Solid white in color. Excellent bending.	Determined by lbs. per 1,000 sq. ft.	70 to 80
Unbleached solid sulphite board[5]	Food, toys, hardware, mechanical parts – where eye appeal is desired.	100% virgin pulps.	0.012 to 0.026	A less-expensive board than solid bleached sulphate. Not so strong nor so bright but is just as clean. Buff shade. Excellent bending.	1,700 to 1,900	
Solid manila board	Same as above, except food.	Virgin pulps and high-grade waste substitutes.	0.012 to 0.030	Available with a white liner and manila back. Excellent bending.	1,700 to 1,900	
Extra-strength plain kraft-type boards	Hardware, automotive and mechanical parts, toys.	Kraft waste and kraft pulps.	0.016 to 0.050	Maintains a minimum test on Mullen and tear. Brown throughout sheet; available in dark colors. Excellent bending.	1,700 to 1,900	
Extra-strength white-lined kraft-type boards	Same as above where more eye appeal is desired.	Kraft waste and kraft pulps.	0.016 to 0.050	Maintains minimum Mullen and tear tests. Top liner is white; filler and back are brown; available in pastel shades. Excellent bending.	1,700 to 1,900	60 to 75

* Prepared by Columbia Box Board Mills, Inc., Chatham, N.Y.
1 Caliper times the number of standard sheets per bundle.
2 Ratio of brightness of paper to brightness of magnesium oxide.
3 Bending qualities are not required in certain boards and in certain uses.
4 Semi-bending chip, a somewhat lesser grade, is lower in price and also in performance. Bending chip takes a 180-deg., whereas semi-bending chip takes only a 90-deg. bend.
5 Unbleached solid sulphate uses are similar to those for unbleached sulphite. Sulphate is also used for bottle carry-outs.
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New challenges in the use of coatings

by Paul K. Wolper*

Coatings on packaging materials form both a functional and an inseparable partnership with support materials such as paper, paperboard, metallic foils and synthetic films. Combinations of coating materials and support materials provide a widely diversified group of materials for many flexible-packaging end uses.

While the basic purpose of protective coatings is protection, they also have a material function which operates to change or adapt the fundamental characteristics of the support material to a more useful form.

The protective functions of packaging coatings include barrier performance against: (1) water; (2) water vapor; (3) gases (O_2, CO_2, etc.); (4) odor and taste changes; (5) greases (fats and oils); (6) chemicals (acids and alkalies) and (7) organic solvents.

The material functions of a coating provide: (1) heat sealing; (2) block resistance; (3) visual appeal (gloss, shine, clarity); (4) durability (scuff resistance); (5) release properties.

First, we should consider the role of the support material, as this must be taken into account in the selection of the proper packaging material for a given end use. At the risk of oversimplifying a complex relationship, it may be stated that the density and finish of the substrate material are determining factors in the amount of coating needed to produce a coating film of the desired characteristics.

Strength of the substrate is also an important factor. For example, for this last reason, lightweight foils cannot be coated unless backed with some other material, generally paper, even though the density and finish of foil are most satisfactory for coating purposes.

Relative incompatibility of the substrate and coating material must also be considered if the substrate is a synthetic organic film. In the same class, although not strictly examples of incompatibility, are glassine and vegetable parchment which are lyophobic or greaseproof papers. These papers provide better surface holdup for coatings than most papers because of this inherent property.

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It is convenient to classify protective coatings on the basis of the means of their application to substrate materials rather than on their chemical composition or physical properties. Thus, three fundamental groups of protective-coating materials for packaging are: (1) *wax coatings* (including hot melts); (2) *solvent coatings* (including organosols and plastisols); (3) *extruded coatings* ("plastic films").

Wax coatings

Wax coatings are the oldest group of protective packaging coatings in use today. There are three classes, based on composition and general properties: (1) coatings of 100% paraffin wax; (2) modified refined paraffin-wax coatings; (3) hot-melt coatings.

Paraffin wax, 100% refined. Paraffin wax, originally a by-product of the petroleum industry, has proved to be the workhorse material in the field of protective packaging coating. It is low in cost and available in good supply. It is chemically inert and nontoxic—properties advantageous in food packaging. Paraffin-wax films are highly water and water-vapor resistant.

Paraffin-wax coatings are applied from the molten state with high-speed waxing equipment, using a combination of rubber and steel squeeze rolls. Wax films can be applied in a wide range of ream weights (lbs./3,000 sq. ft.) depending on the substrate material, waxer speed, wax temperature and rubber-roll density. For example, waxing-grade sulphites may carry from 10 to 20 lbs. or more of wax per ream, whereas the waxed-glassine grades may carry anywhere from 2 to 10 lbs. of wax per ream.

Some trade terms may need explanation. If a limited quantity of wax is applied to a relatively porous base paper at high temperature and the waxed paper wound up hot, the wax will saturate the sheet leaving little or none on the surface, resulting in the "dry-waxed" paper. Similarly, a "wet-waxed" sheet is prepared by waxing at lower temperatures, followed by chilling the wax film prior to winding cold off the waxer. In this case, most of the wax remains on the surface as a continuous film. Machine finish (MF) or supercalendered (SC) sulphites or krafts, or boards, may be waxed either way. Glassine and vegetable parchment, due to their density and greaseproofness, are "wet-waxed" only.

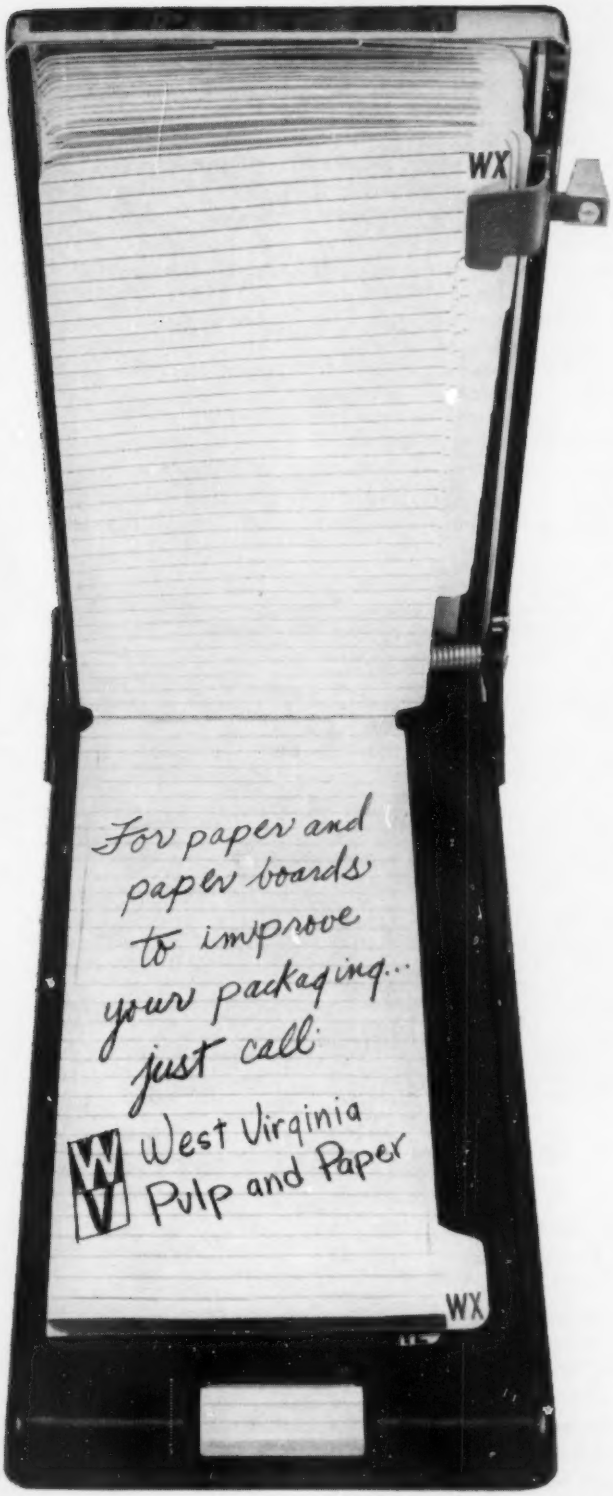
The rate at which the molten-wax film is cooled affects both the penetration of the wax into a paper substrate and also the other properties of the wax film. A given wax film on paper will be partially cooled and solidified before it reaches the chill rolls at the end of the waxer. If the paper is quick-chilled by a cold-water fountain at this point, a film of extremely high gloss results. A waxed paper so prepared is termed "water waxed." Compared with a regular wet-waxed paper of the same composition, the water-waxed paper has a much higher finish but a significantly poorer degree of water-vapor resistance. In general, "dry," "wet" and "water" waxing operations are possible with all three classes.

The advantages of paraffin-wax coatings are offset to some extent by other characteristics. Paraffin-wax films are not particularly durable and are subject to marring or scuffiing. With melting points in the range of 122 to 150 deg. F., these films readily block under temperature conditions which can prevail in transport in summer. Though this can be overcome by the use of refrigerated cars or vans, blocking resistance remains a problem under other conditions. It is significant that the term blocking originated in the waxed-paper field because in extreme cases blocked waxed paper resembled a solid block of wax.

The melting-point ranges of refined paraffin wax suggest the relative ease of heat-seal coatings of this material. However, because of the low cohesive strength of paraffin wax, heat seals are not strong enough to permit complete dependence upon them for package fabrication. Adhesives are generally used for bottom and side of bags or envelopes. Waxed papers used as carton wraps or liners have heat-seal strength which is adequate for these functions.

Modified paraffin-wax coatings. This class of coatings originated as a logical development of the unmodified par-

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affin coatings. Formulations in this category were developed on the principle of eliminating or correcting deficiencies of refined paraffin-wax coatings while still maintaining the extremely desirable properties of paraffin wax.

Roughly speaking, the modified paraffin-wax coating will contain up to about 10% by weight of the modifier. The most common modifiers used today include microcrystalline waxes of various softening points, butyl rubber, polyisobutylene, polyethylene and other resins. The modifiers are blended with paraffin, either singly or in combination, to improve heat-seal strength, gloss and film durability. The modifiers must be used with discretion, for as their concentration in the wax blend increases beyond the rough limit already indicated, the original paraffin-wax properties may be seriously degraded. Moreover, modifiers as a class are more expensive materials than paraffin wax, so that their increased use raises the cost of the coating material. And in high concentrations they may significantly slow waxing speeds.

Within the limits already described, the modified wax coatings commercially available retain the general level of water-vapor resistance of unmodified paraffin wax. At the same time, the heat-seal quality of the modified wax coatings is improved and they may be used on automatic equipment without special adhesives.

Hot-melt coatings. These include all formulations of wax and modifiers where the concentration of modifiers exceeds 10% by weight. Though this is an arbitrary classification, the hot-melt coatings are always highly modified wax blends, containing the modifiers mentioned above plus others including ethyl cellulose cyclized rubber and butadiene-styrene copolymers.

Special equipment is required to apply hot-melt coatings; temperatures varying from 250 to 400 deg. F. are required to bring melt viscosity within range of practical operating values.

Hot-melt coatings are characterized by extremely strong heat seals and fair blocking resistance. The coatings are more durable than the paraffin-wax types and can be made with good gloss and clarity. The water-vapor transmission rates of this class of coatings are generally higher than those obtained with the paraffin types.

Solvent coatings

Solvent or laquer coatings may be classified broadly by the type of solvent system employed. Two types are

1. *Organosol*—a resin and plasticize

Properties of protective packaging coatings

Coating material	*Base material*	*Wt.,lbs./3,000sq.ft.(reams)*			*Heat-seal range,°F (reciprocating jaw, 0.5-sec. dwell)*	*Water-vapor permeability at 100° F, 90% R. H. uncreased, grams/100 sq.in./24 hrs.*	*Grease[1] resistance*
		Coating	*Base*	*Total*			
WAX COATINGS							
Refined paraffin wax	MF[2] sulphite	5	25	30	—	High	Poor to fair
	SC[2] sulphite	10	25	35	150-180	0.7-2.0	Fair
	Glassine	4	25	29	150-180	0.2-0.4	Good
	Glassine	6	25	31	150-180	0.1-0.2	Good
Modified paraffin wax	SC sulphite	10	25	35	150-180	0.7-2.0	Fair
	Glassine	8	25	33	150-180	0.1-0.2	Good
Hot-melt types	SC sulphite	10	25	35	200-350	High	Fair
SOLVENT COATINGS							
Cellulose nitrate	SC kraft	8	32	40	200-300	1.2-1.8	Good
	Glassine	3	22	25	200-300	0.4-0.8	Good
	Cellophane	2	20	22	200-300	0.4-1.0	Good
Cyclized rubber	SC kraft	8	32	40	200-300	0.6-1.0	Fair
	Glassine	3	22	25	200-300	0.15-0.25	Good
Butadiene-styrene	Glassine	3	22	25	200-300	0.15-0.25	Good
Vinyl copolymers	SC kraft	5	25	30	220-280	4.0-6.0	Good
	Glassine	3	22	25	220-280	2.5-4.0	Good
Vinylidene chloride (Saran-type)	SC kraft	6	25	31	250-300	2.0-3.0	Good
	Glassine	4	25	29	250-300	1.0-2.0	Very Good
	Cellophane	4	20	24	250-300	0.5-0.7	Very Good
EXTRUDED COATINGS							
Polyethylene							
Low density 0.5 mil	MF or SC kraft	8	25	33	200-300	2.5-3.5	Fair
1.0 mil	MF or SC kraft	15	25	40	200-300	1.2-1.6	Good
2.0 mil	MF or SC kraft	30	25	55	200-300	0.6-0.8	Very Good
0.5 mil	Foil-glassine	8	42	50	200-300	Less than 0.02	Excellent
2.0 mil	Cellophane	30	24	54	200-300	0.5-0.7	Excellent
Med. density 1.0 mil	SC kraft	15	25	40	250-350	1.0-1.4	Good
High density 1.0 mil	SC kraft	15	30	40	275-375	0.6-1.0	Good

1Depends on type of grease and other factors. 2MF = machine finish; SC = supercalendered.

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Very Good
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combination dispersed in a mixture of organic liquids of the polar and nonpolar types. The polar liquid acts as dispersing agent or solvent and the nonpolar liquid as diluent.

2. *Plastisol*—a synthetic elastomer suitably dispersed in liquid plasticizer.

Since most commercial "lacquer" coatings available for packaging are of the organosol type, an alternate classification by chemical identity may be preferable. This can be subdivided into thermoplastic and thermosetting types. For practical purposes, this subdivision is based on heat-sealing or nonheat-sealing characteristics of the respective coatings.

The heat-sealing quality of the thermoplastic types of solvent coatings is invariably very good, while the companion quality of blocking resistance is also good. In both respects solvent coatings are superior to wax-type coatings. Because of their strong positive heat seals at temperatures from 200 to 300 deg. F., this class of coatings made many new types of packaging materials available for use on automatic equipment.

Both types of solvent coatings are characterized by their durability, gloss and clarity, suiting them for use as overprint coatings on label stock as well as with printed flexible-package materials. Many of the coatings are highly water-vapor resistant.

Cellulose nitrate has been used successfully for a longer period than any other solvent coating. Characterized by good grease resistance, it can be formulated with varying degrees of water-vapor resistance by the addition of small quantities of paraffin wax. Cellulose-nitrate coatings are probably one of the least expensive of the solvent coatings and have had the widest use on all types of paper; also, they are the principal protective coatings used on cellophane.

Cellulose acetate and other cellulose derivatives are used for special purposes only. for they are not water-vapor resistant to any degree. They form tough, durable films of high clarity and good grease resistance.

Cellulose acetate butyrate and cellulose triacetate coatings are useful as release-coating materials because of high temperature resistance.

Cyclized rubber (natural rubber) combines excellent water-vapor resistance with remarkably strong heat seals over a wide temperature range. The sealing quality requires special precautions, such as silicone or Teflon

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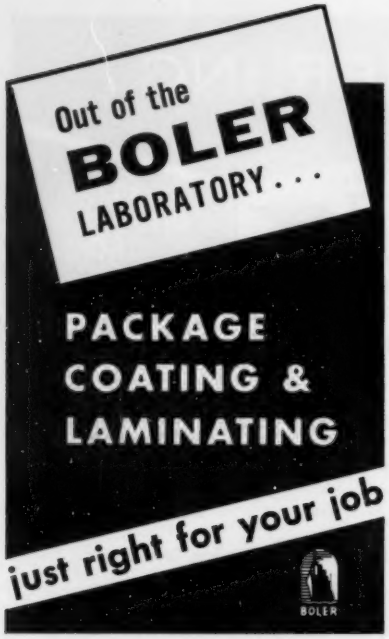
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on heat-sealing jaws of packaging equipment.

Butadiene-styrene copolymers. Synthetic rubber coatings possess the excellent water-vapor resistance and heat-sealing properties of natural rubber coatings but pose fewer operating difficulties on packaging equipment, as no special release materials are required on sealing jaws. They are not as grease resistant as others.

Vinyl copolymers. Many different vinyl copolymers are now available. They differ in minor respects, but all have good grease resistance. Vinyls are not highly moistureproof coatings, but in this respect are between the rubber polymers and the cellulose derivatives other than cellulose nitrate.

Vinyl coatings, however, are being developed that promise better resistance to water vapor than the cellulose nitrate types. This class of coatings possesses considerable formulation possibilities by which varying ranges of heat-seal temperatures and strengths can be achieved. They have specific solvent resistances useful for some types of liquid packaging.

Saran (polyvinylidene chloride) coatings are widely used on cellophane. Interest in their use on paper and foil substrates has been increased by European development of emulsion saran coatings. European use has been characterized by coating weights of 20 to 30 lbs. per 3,000 sq. ft. ream and, in this weight range, good barrier properties are realized. Saran resins for emulsion and solvent coatings are available domestically but for economic and other reasons coating weights tend to be lower—resulting in less barrier protection. The inherent properties of saran in film form are realized by the coatings, regardless of coating weight or application. Pound for pound, saran coatings properly applied offer more moisture-barrier and flavor protection than the conventional extruded polyolefins.

Extruded coatings

As a group, extruded coatings have made a definite impact in packaging, extending the scope and concept of unit packaging. Nowhere else in the field of coatings for packaging has there been such a sustained development of new and improved materials.

Polyethylene is still the number one material in extrusion coatings. Conventional low-density polyethylenes have been augmented with medium- and high-density resins. In general, increases in resin density are accompanied by improvements in barrier properties. Paper, film, foils and boards are being commercially coated with the medium-density polyethylenes. High-density polyethylenes are used where improved physical properties are necessary or where lower coating weights may give equal performance at lower cost. Curl and lack of adhesion may present some problems.

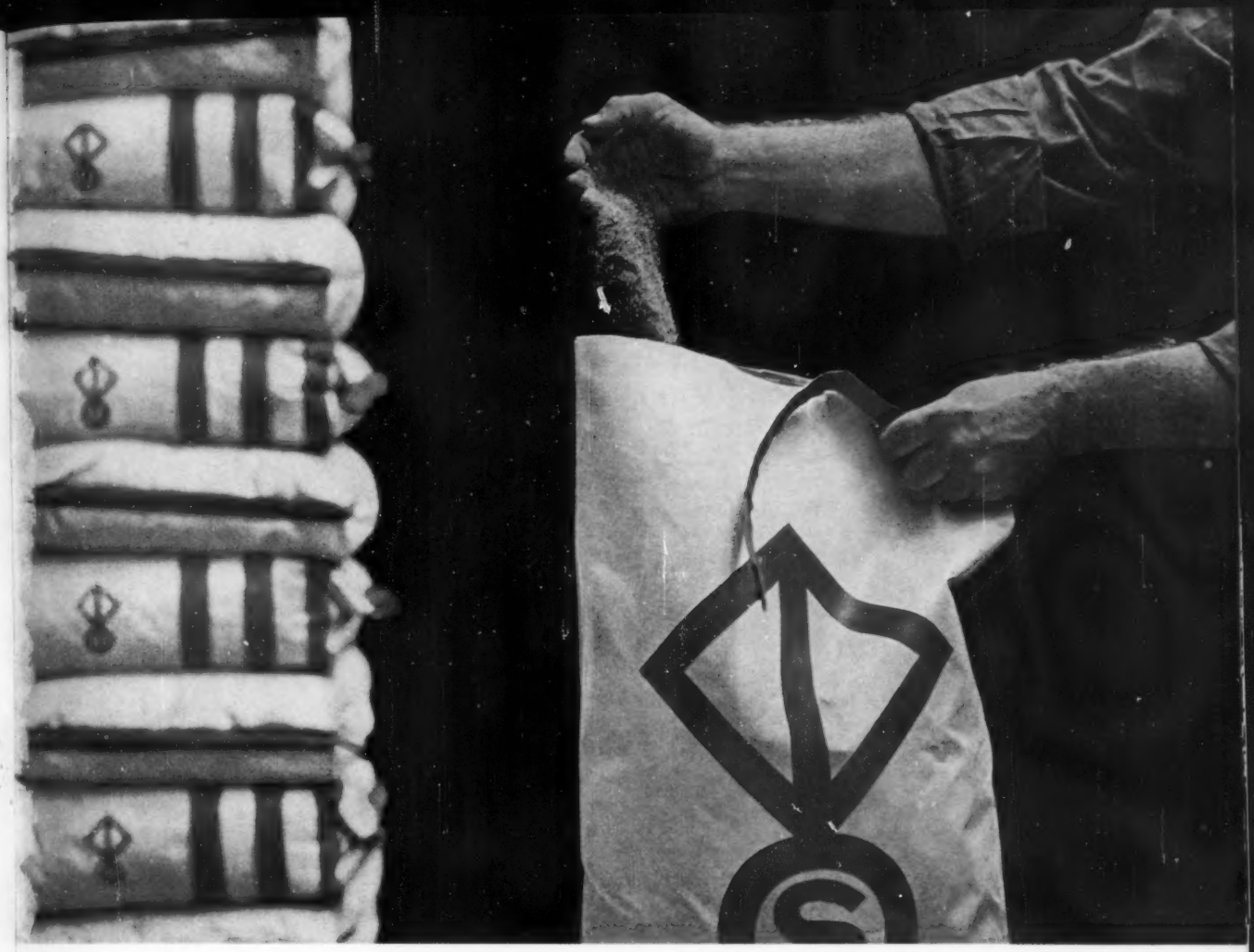
Polypropylene as an extrusion coating resin is still relatively undeveloped. The major attention of the producers of this resin has been focused on its extrusion as an unsupported film. Experimental work to date indicates that the polypropylenes can be used to advantage on flexible substrates for the same reasons that polyethylene extrusion coatings have found widespread use. However, more work must be done to develop resins with better processing properties for coating uses.

Extrusion coatings of *polyvinylidene chloride (saran)* and *polyamide (nylon)* resins are available and used for special purposes. Saran extrusions on paper or other substrates have excellent barrier properties against water vapor and gases. Nylon has strength and grease resistance.

The fundamental advantage of this type of coating is that it makes possible the use of thin films of materials, whereas unsupported film may be relatively costly and hard to handle. Where unsupported films of more than 1 mil in thickness were formerly required, it is possible to extrude films of less than 0.5 mil on various low-cost types of substrates. Just as with the solvent and wax-type coatings, the substrate materials add their own properties to those of the plastic film used, creating new materials with new properties combinations.

In retrospect, the past two or three years were a period of re-evaluation and consolidation for functional coatings. The requirements of the amended Food, Drug & Cosmetic Act have been complied with by this industry. Naturally, the law retarded development and market acceptance of new coatings, since the F&DA status of new materials must be established as a prerequisite to applications development work.

All coatings discussed here may be formulated to meet F&DA requirements. Questions as to the acceptability of specific coatings or applications should be referred to the individual supplier for a responsible judgment.



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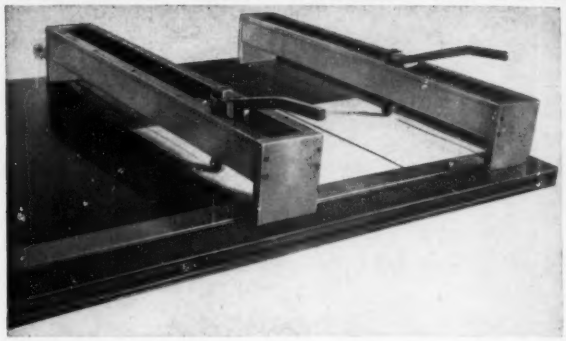
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Trends in displays and merchandisers

Display devices, to be acceptable at point of sale, should be planned to fit into the store layout. Competition is keen and the fight for floor and shelf space is constant. To make a place for themselves in-store, merchandisers must have good design and art treatment. Full-color reproductions are more and more in demand and the use of light and/or motion to add selling impact is also an increasingly popular addition to display construction.

The counter display, which has gained widespread acceptance in smaller retail outlets, to be most effective, should be of a size and shape that is not too large or bulky for convenient use. The display which interferes with the proper serving of a customer will wear out its welcome.

Theoretically, the materials that can be used in point-of-purchase displays are unlimited. However, most basic materials in present use are paper, paperboard, wood and wood products, metal and wire, glass and plastics.

The use of plastics continues increasingly popular, with plastic foam a relative newcomer of broadening application; while paperboard, used alone, has the widest range, because of its economy and suitability to short-term promotions. Its increased use has been particularly evident in the construction of floor stands and counter dispensers, where its ease of assembly and sturdy construction assure a useful life span at modest cost.

Formed plastic sheets—principally acetate, styrene and vinyl formulations—have been coming up fast as a popular display medium. The amazing formability of the materials makes available a range of colorful, three-dimensional, lightweight trade characters, replicas and novelty pieces. Wall plaques formed from sheet and featuring three-dimensional containers in full color are a new trend in the beverage industry. Cost of the units is relatively low and service life long.

Much work is being done in pre-printing the plastic sheet before forming. This cuts the cost of the pieces even more as it opens up rotogravure and offset printing in addition to silk screening and offers multicolor work with a minimum of hand operations.

Because mold costs are low (plaster of Paris, wood, plastic, etc.) greater freedom is offered in display sizes. Huge wall displays and package replicas for indoor and outdoor displays are being produced; they dwarf efforts made with other materials.

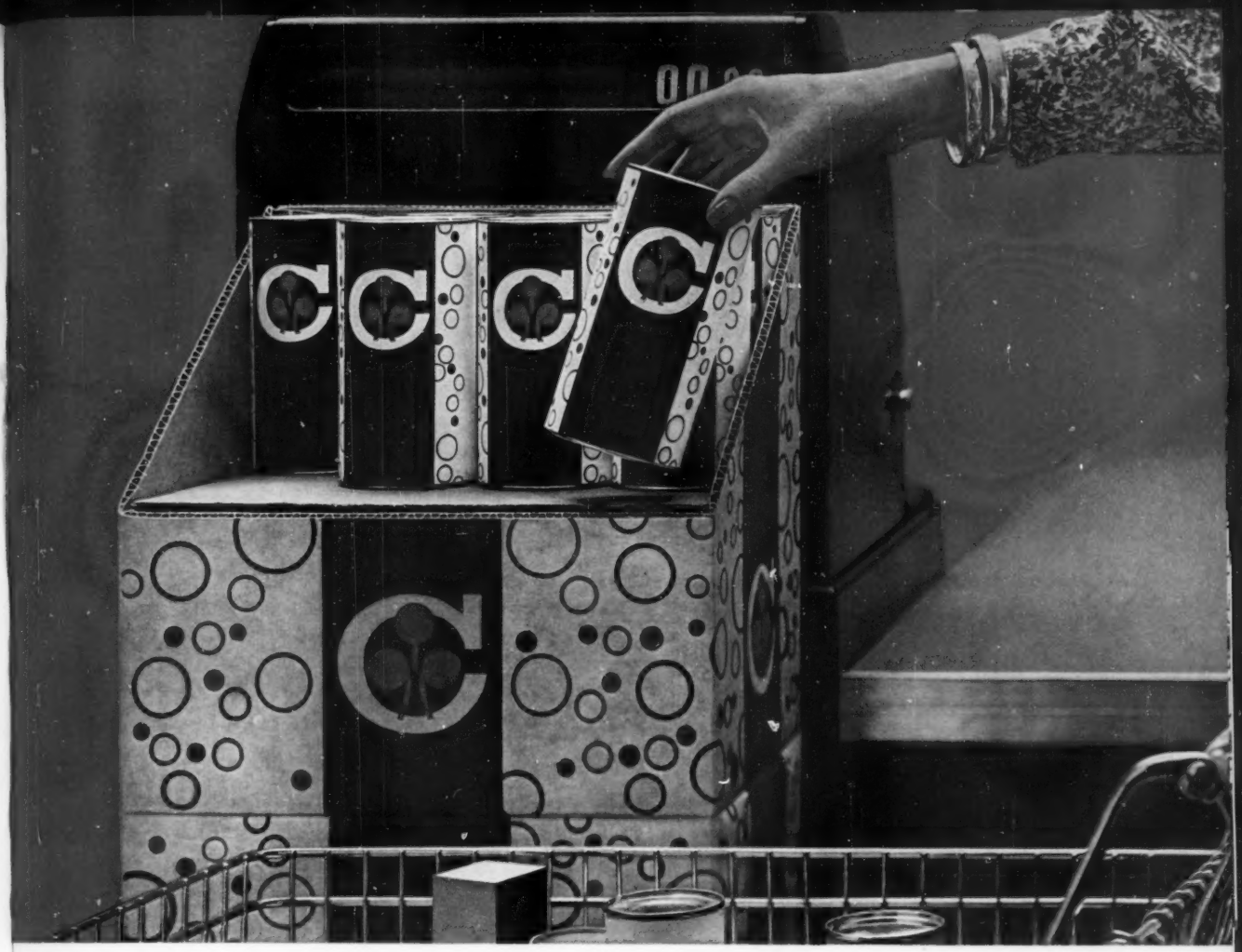
Certain locations in the store lend themselves to displays. For example, almost all retail stores that can profit by attracting the patronage of the passer-by use their windows.

Within the store, several choice locations offer excellent display spots. However, despite varying emphasis, they all present possibilities and may be classified as follows:

1. Cash, information and sales counters.

2. The walls. Wall space includes the spaces behind counters which may show a recessed shelf or counter; the remaining free wall space, which may consist mostly of shelves; or a blank wall area.

3. The floors. Recent display technique has capitalized on the space at each end of island counters for separate displays; the space immediately adjacent to the cash-register counter, chiefly for jumble baskets; the area immediately right and left of exits.



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SOLUTION: International Paper's new *pastel* Gator-Hide® linerboard gives you *three* colors with two-color printing.

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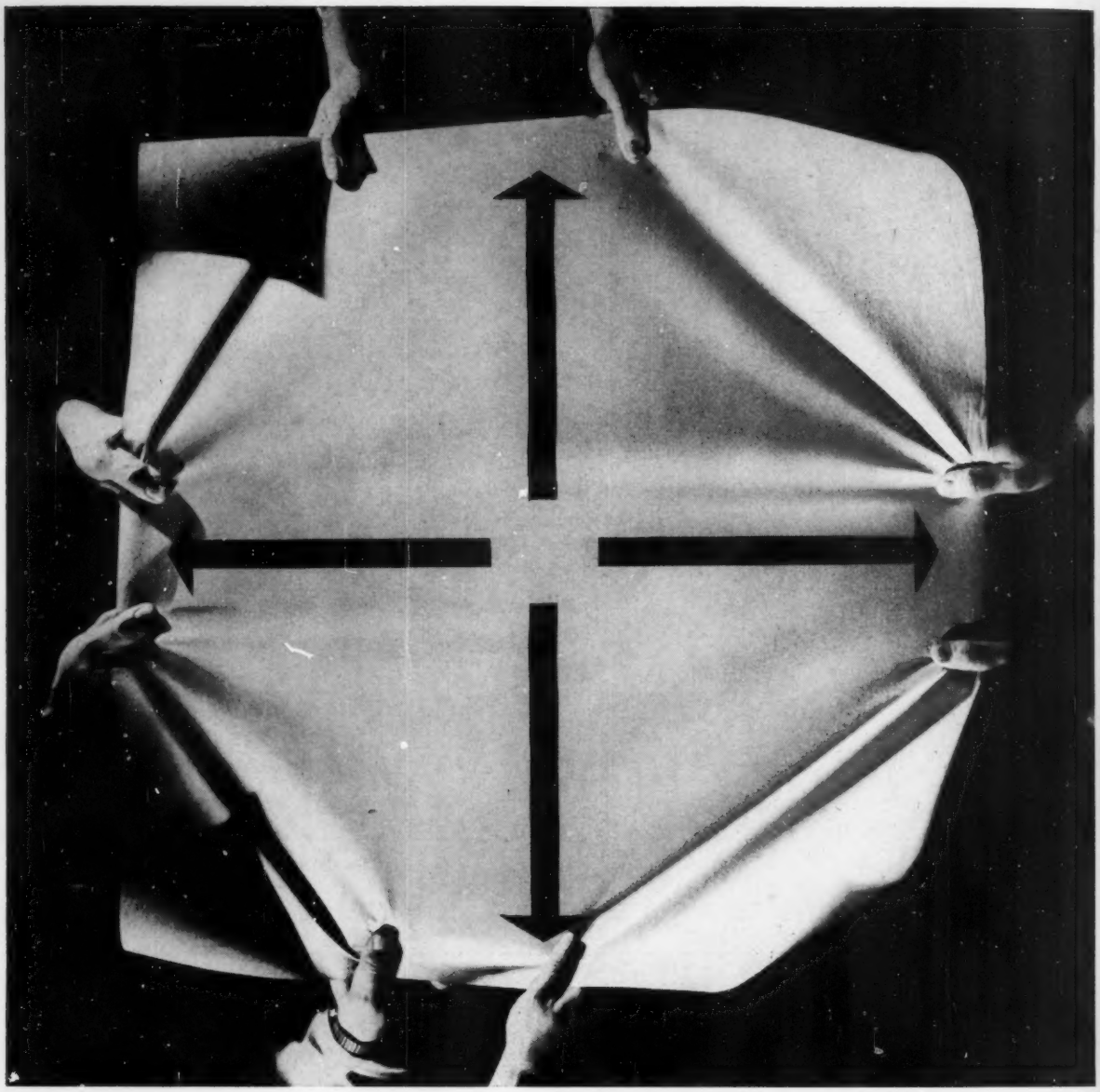
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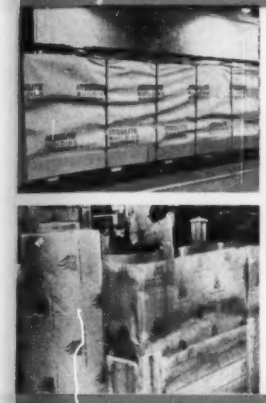
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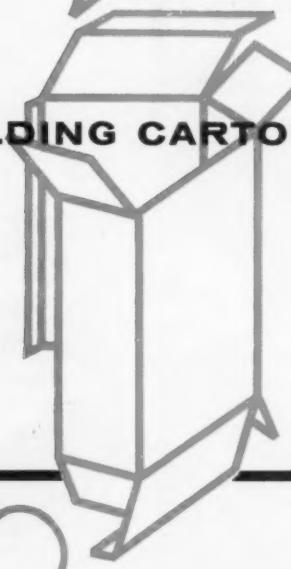
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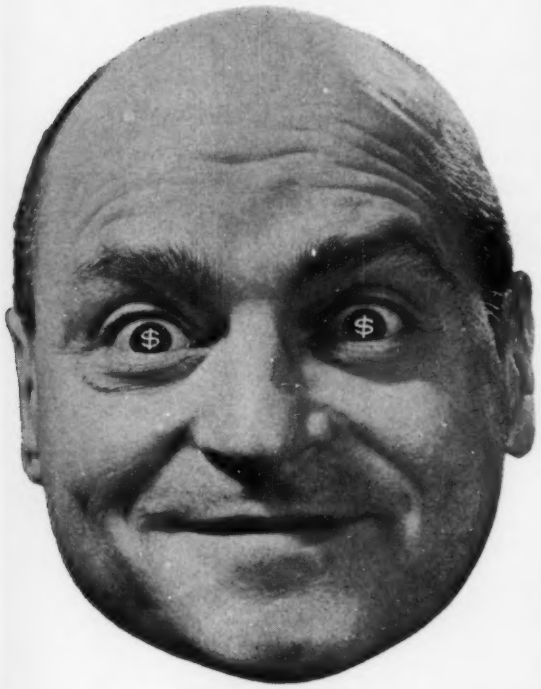
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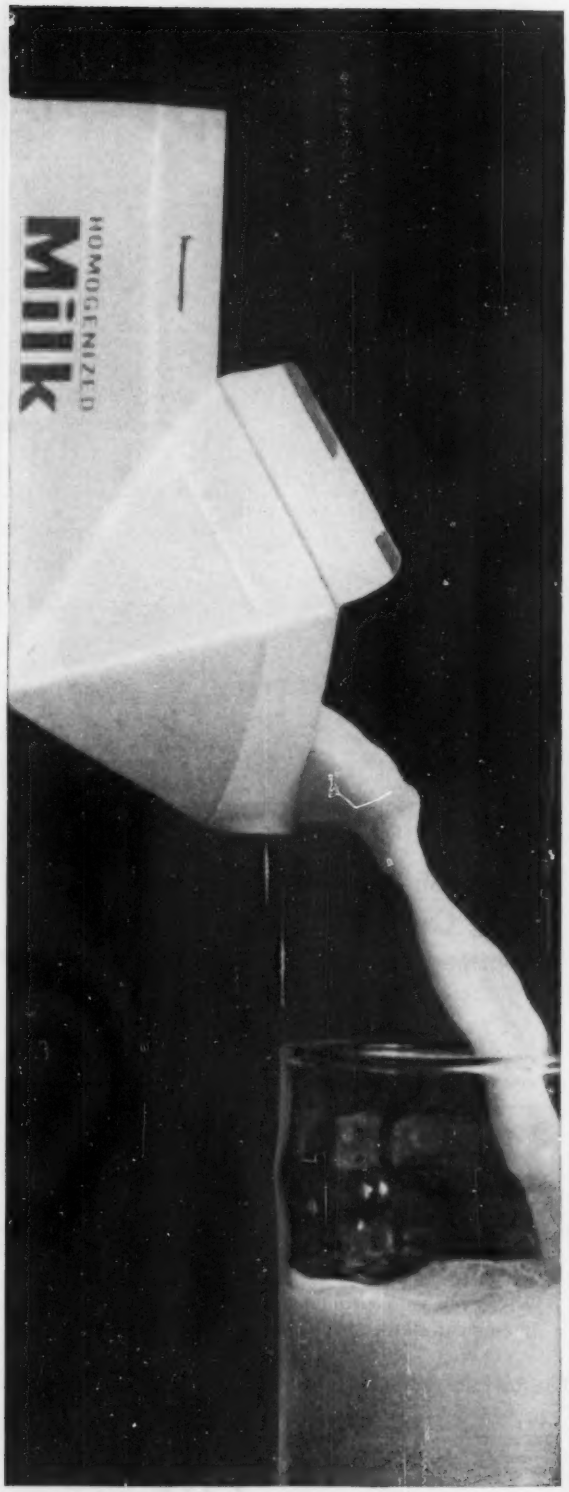
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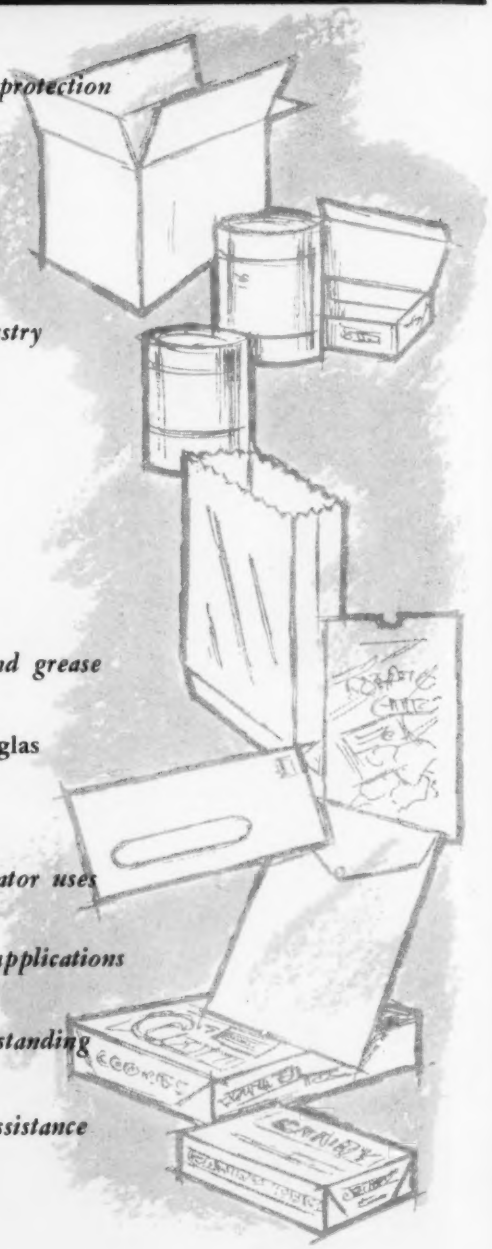
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a new vinyl resin that gives wax greater versatility in packaging

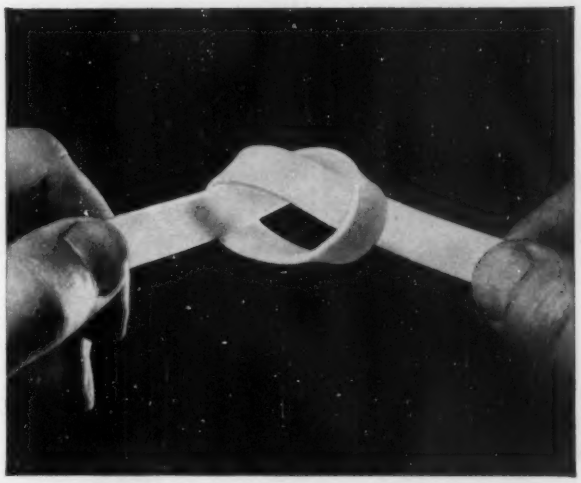
"Elvax" is a new, high-molecular-weight vinyl resin that makes possible low-cost wax coatings of superior adhesion, flexibility and toughness with excellent water-barrier properties.

With "Elvax" you can, for the first time, control the water-vapor transmission rate (WVTR) of wax coatings simply by varying the ratio of "Elvax" to wax. As little as 5% of "Elvax" added to wax reduces the creased WVTR of unmodified wax coatings by 50% without impairing the flat WVTR. In addition, resistance to grease penetration is improved significantly. When 40% "Elvax" is blended with wax, flexible 1-mil coatings with flat and creased WVTRs of 0.2-0.4 gms./100 in.^{2}/24 hours are obtainable.

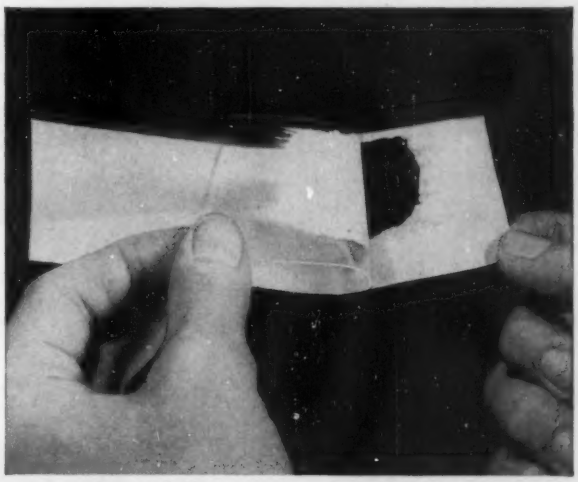
You can obtain tough, flexible adhesive bonds using "Elvax" alone or combining it with waxes, resins, rosins and rosin derivatives. "Elvax" exhibits strong adhesion because of the chemically active polar groups in its molecules. Flexibility and toughness (see upper right) result from its rubber-like, noncrystalline structure and high molecular weight. Hot-melt, solvent and pressure-sensitive adhesives based on "Elvax" adhere tightly to all films used in packaging today (see right).

Since "Elvax" will be used in food packaging applications, Du Pont is currently completing a nineteen-month study which will be used to petition the FDA for permission to use "Elvax" where contact with food is concerned.

"Elvax" is now available in experimental quantities for your evaluation. Our new booklet on "Elvax" provides information on properties and application methods . . . suggests possible uses. Write: Du Pont, Electrochemicals Dept., Vinyl Products Division, Room N-2532, Wilmington 98, Delaware.



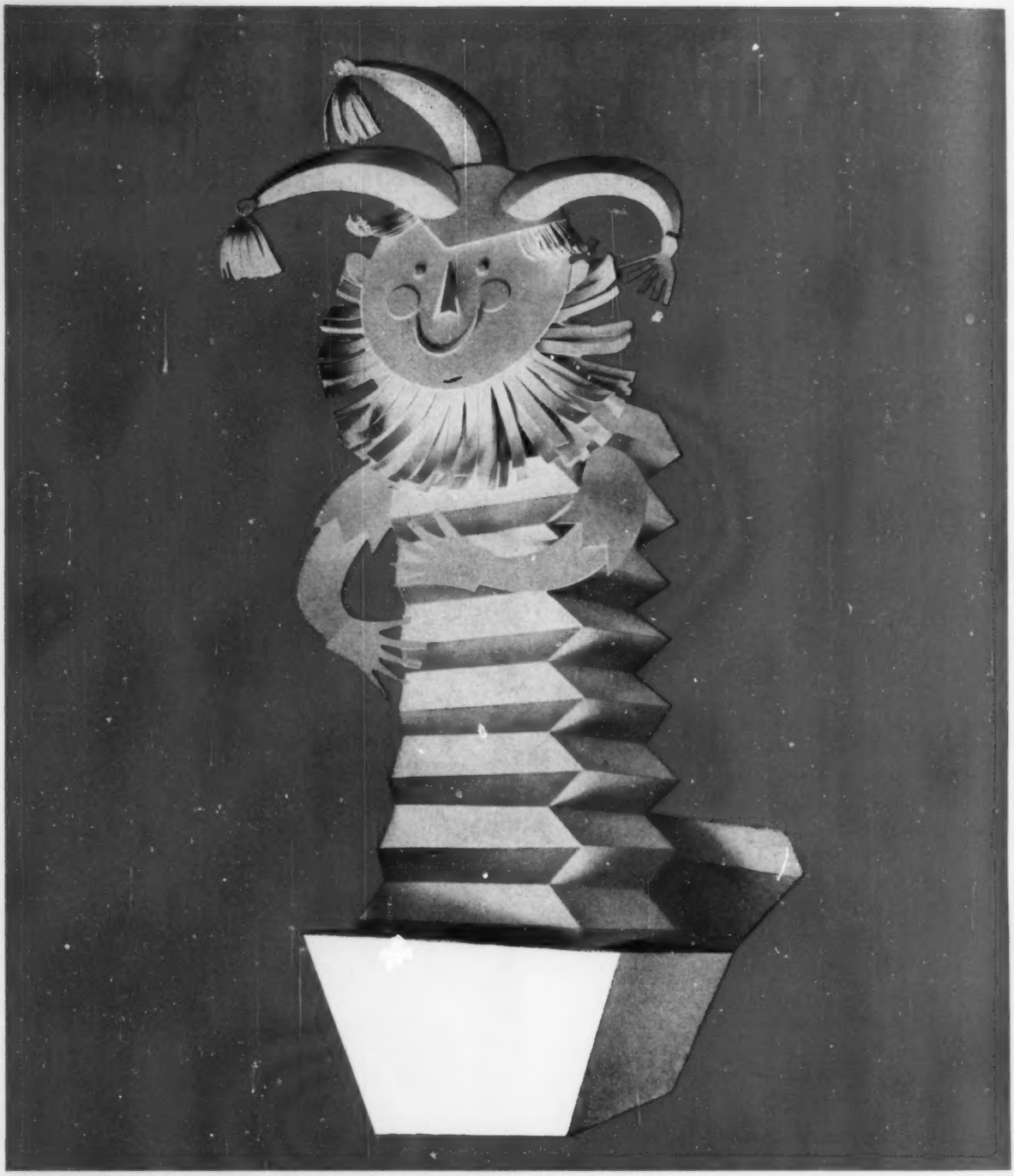
FLEXIBILITY is demonstrated by tying a strip of paraffin wax, blended with 40% "Elvax", into a knot. When "Elvax" is added, the strip becomes plastic...will take 50% elongation before it breaks . . . is flexible at –20°F.



ADHESIVE STRENGTH of wax extended with 40% "Elvax" is shown by the fiber-tearing bond obtained when paper coated with "Elvax"/wax is heat-sealed to polyethylene. Coatings based on "Elvax" heat-seal to all films used in packaging today.

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SECTION 4

FILMS, FOILS, LAMINATIONS

PLASTIC FILMS

Growth in diverse directions is the continuing record of plastic films. Types, grades, properties, formulations and applications are undergoing improvements and successfully reflect the reach for newer and better packaging uses. Machinability problems are being solved. Advances are being made where economy is concerned. (See cost chart, p. 17.)

The following articles discuss polyethylene, cellulose acetate, Cryovac, Pliofilm, polyester, polypropylene, polystyrene, saran, vinyl and a group of specialty and newer films including water soluble film, nylon and fluorohalocarbon. For additional investigation, refer to the chart "Properties of Packaging Films," p. 131.

Polyethylene film

by A. E. Irvine*

About 280 million pounds of polyethylene film were used in packaging in 1960, a 30-million pound increase over 1959 and almost triple the amount used just six years ago.

The bright future of polyethylene film is indicated by its continued penetration into new markets. The most important market opener for polyethylene in recent years has been the designing of automatic overwrapping machinery to handle polyethylene. As recently as 1957 there was little or no commercial automatic wrapping of consumer products with polyethylene. The softness, extensibility, and heat-sealing characteristic prohibited the use of conventional machinery which was designed for comparatively stiff materials, such as cellophane and wax paper.

Evidence that these technical problems have been overcome can be seen on retail shelves. Paper products were first to swing over to polyethylene overwraps to any significant degree. In breadwrapping, there were some special machine handling difficulties, but notable progress has been made recently in this huge packaging market, too. Several soft-goods manufacturers also made early switches to polyethylene wraps.

Most recently, polyethylene overwraps have entered the areas of tray packs and multi-unit packs. The candy industry was among the first to use polyethylene-wrapped trays, and leading producers of cereals have been changing over some of their multipack lines from cellophane to polyethylene film.

Along with the new machinery, developments in resin technology played an important role in achieving the breakthrough in automatic overwrapping. One of the key factors has been the development of resins specifically tailored to this market. For example, medium-density polyethylene resins produce a stiffer film which handles better in many automatic operations, particularly bread wrapping. However, the cost of some of these films runs higher than standard low-density polyethylene films.

Of course, polyethylene film made from low-density resin is still the most widely used type of polyethylene film by far. However, medium-density resins are rapidly gaining in popularity, particularly in the area of automatic packaging. Linear or high-density polyethylene is still a minor factor, although some commercial success has been achieved within the past year in the construction of shipping bags and some specialty applications.

*Market Manager, Union Carbide Plastics Co., Div. of Union Carbide Corp., New York City.

Properties

The commercial density ranges for polyethylene film are as follows:

Low density—0.910 to 0.925
Medium density—0.926 to 0.940
High density—0.941 to 0.965.

Properties and characteristics for these density ranges are given in the film properties chart (page 131). The basic advantages of polyethylene film as indicated in the chart are high yield, toughness, superior heat sealability, excellent shelf life, very good optical characteristics, low temperature strength, low water absorption, resistance to moisture, and chemical inertness.

Polyethylene boasts one of the highest yields per pound among transparent films. This, plus its *low cost* per pound, has firmly established polyethylene as the lowest-cost transparent film.

A combination of mechanical properties gives polyethylene film its unusual *toughness*. The film has high resistance to rips and tears, and thus lends itself to fast, easy, safe handling in shipping, storing and retailing, and in re-use. The potato bag is a familiar use which takes full advantage of the film's toughness.

Combining high toughness with excellent optical properties is regarded as one of the most significant recent developments in polyethylene-film formulations. These new films have almost double the impact strength of standard clear films, a development that has proved a boon to polyethylene usage in frozen-food packaging. It also is resulting in sales-stimulating

packages for heavy produce, hardware, dried foods, and rack and counter merchandise. Liners and shipping bags are other likely uses.

Since film toughness decreases as density increases, most medium-density and high-density films are not suitable for some of the above applications. However, the higher stiffness and improved barrier properties of these films are expected to develop other markets for polyethylene. In the case of medium-density materials, this already is taking place.

Polyethylene of any density has *excellent dimensional stability*. It gives top product protection after long storage periods. It has high resistance to moisture absorption. It does not dry out, embrittle, split, or lose its strength. It stays strong and flexible at subzero temperatures, making it a natural for frozen food packaging.

Among the most important end-use advantages of polyethylene film are its properties of *low moisture and high gas transmission*. Because of its excellent moisture-barrier properties, the film minimizes weight loss of moist products and at the same time allows oxygen to pass through so the product can "breathe." This transmission balance is especially beneficial in fresh-produce packaging.

The high gas-permeability rate of polyethylene film, of course, precludes its use in some other packaging applications. Gas-barrier properties improve, however, as the resin density is increased; thus, if the product to be packaged requires high gas-barrier performance but moderate film toughness, a medium- or high-density polyethylene film should be considered. Low-density polyethylene has proved very valuable also when used in combination with high gas-barrier materials because it contributes strength, flexibility and heat sealability.

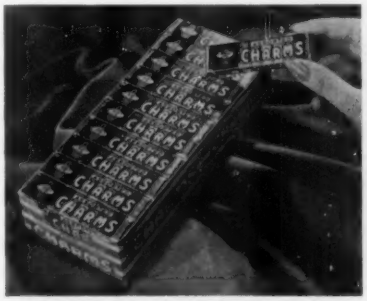
The fact that polyethylene film *blocks moisture passage* is one of the big reasons it is widely used to package dry products such as cake mixes, dried beans and, most recently, sugar.

Polyethylene film is noted for its *chemical inertness* and is used extensively for lining shipping containers for chemicals. Only a few chemicals such as the strongest oxidizing agents will affect it.

While adequate in most cases, the grease and oil resistance of polyethylene film is not as high as that of some other flexible packaging materials. Here, too, however, the higher-density films represent significant barrier improvements and thus show promise of opening new packaging markets for polyethylene.

A leading consumer-appeal feature of polyethylene film is its soft texture, another property which decreases as density increases. This soft feel has proved particularly advantageous in the merchandising of textile and certain paper products. Also, as mentioned previously, polyethylene films are now readily available with outstanding clarity and sparkle. Some of the newest polyethylene films have gloss and see-through values very close to those of cellophane. When teamed with the new levels of impact strength, these excellent opticals offer the packagers what amounts to a completely new type of packaging material and, therefore, give polyethylene increased potential in many markets.

Re-use is another important feature for consumers. Storing items in a polyethylene bag has become a household institution, even to a point of creating a market for dispenser boxes of polyethylene bags.



TRAY UNITS of 20 packages now automatically overwrapped in polyethylene which retains needed strength for shipping, storage, shelf life. (*Union Carbide Plastics photo*)



SPAGHETTI in heat-sealed polyethylene bag is well displayed, keeps crisp and is clean and flavorful. Another advantage is that it can be broken while it is still in the package. (*Eastman Chemical photo*)

Convertibility. The film is an excellent material for the manufacture of bags, envelopes and pouches—in a variety of sizes and constructions. In recent years, an important advance has been the development of improved edge-seal techniques that produce bags with practically no fin. This seal saves material and is strong and neat.

Polyethylene film is printed by flexography, gravure and screen process. Because of polyethylene's chemical inertness, conventional coatings, printing inks and adhesives will not readily bond to the untreated surface well enough to meet commercial standards. The development of special surface-treating techniques over the past few years has overcome this drawback.

End uses

The properties of polyethylene film make it ideal for bags and pouches. The leading end-use area at present is fresh produce. This market used some 75 million pounds of polyethylene in 1960 and still has plenty of room to grow. The second biggest user is the dry-cleaning industry. Other major markets are rack and counter merchandise, candy, dried grocery products and such perishables as baked goods, meats, fish and poultry.

A new and interesting use of polyethylene bags is in the publication field. Since The New York Times started mailing its Sunday edition in polyethylene throughout the country in 1959, several other papers and trade magazines have followed suit. Better protection and a more economical wrapper are reported.

Multi-unit packages of various types are another promising area for polyethylene bags, especially among food and beverage producers. The draw-string bag has been particularly successful.

Refinements in automatic form-fill-seal equipment have substantially expanded markets for polyethylene packages. Already, individually frozen fruits and vegetables are a large-volume use for this type of polyethylene packaging. Other new and promising areas include sugar and packages for raisins and other moist products.

There have been a number of signs lately that polyethylene film will become an increasingly important factor in protective shipping. For example,

huge polyethylene bags are used by leading aluminum producers to protect ingots in storage and shipment. The all-film shipping bag is being used also for seeds, fertilizer and similar products. New developments include an interleaf of polyethylene film laminated between two plies of paper in a multiwall bag or laminated to the paper on the inside of the bag. Another is the use of a valve insert made from polyethylene film to prevent leakage of dry chemical products in multiwall bags.

Film liners for drums, cartons and crates represent a large existing and potential market for polyethylene. (See article on film liners in Section 17.)

A promising development concerns polyethylene skin packaging. Ceramic companies were the original users; now use has spread to the household moving industry and the electronics and aircraft industries. Some department stores are also using this method for china and glassware deliveries.

Of all the end-use areas, the key to the immediate future growth of polyethylene film remains in automatic overwrapping. Polyethylene's penetration into the baking industry has only begun. Bread wrapping, of course, holds the greatest potential, but the successful commercial use of polyethylene in tray wraps indicates that it should find widespread use for other bakery products as well. Candy, cereals, tea—just about any market using overwraps is a potential. With continued progress expected in resin development, film manufacturing and packaging machinery, it is certain that there are many new opportunities ahead for users of polyethylene film packages.

Cellulose acetate

by D. S. Hopping*

Good aging properties and resistance to dimensional change recommend cellulose acetate for overwrapping many items which have a long shelf life. Acetate will give the package a highly transparent and lustrous wrap at comparatively low cost. In addition, it can be handled on most automatic wrapping equipment by solvent sealing. On more recently designed heat-sealing equipment, special heat-sealing formulations of acetate can be run.

* Celanese Plastics Co., Div. of Celanese Corp. of America, Newark, N. J.



PRACTICAL skin package uses polyethylene extrusion coated to cellulose acetate. Acetate provides excellent forming characteristics; polyethylene permits economical heat sealing to uncoated, unperforated board. (*Celanese photo*)

Acetate film is a thermoplastic, transparent film which is uncoated, odorless, tasteless and nontoxic. It is produced by casting or extruding in a number of formulations, each of which is usually tailored to specific end uses.

Its adaptability to automatic packaging machines has increased its importance as an overwrapping material. Because of its insensitivity to softening by water and its high rate of water-vapor and gas transmission, it has played an important part in the packaging of fresh fruit and produce. F&DA-acceptable acetate films are available for direct contact packaging of foods of all types. Because of its economy and specialized physical properties, there has been a continuing growth in production of extruded film for overwrapping all types of paper products, soft goods, games and puzzles, and some specialty items.

Its wide use in laminations is a tribute to the physical characteristics of acetate. Acetate to paper produces an outstanding quality box-covering material. Other popular combinations include acetate and heat-seal-coated aluminum foil, sometimes with a layer of Pliofilm, saran or vinyl to give added moisture protection. In these combinations, acetate is the outer layer, frequently printed, supplying the tougher, greaseproof, pinhole-free support for the foil. Acetate film combinations provide maximum protection for ordnance, machine parts, tools, food concentrates, soluble beverages, dehydrated foods, and antibiotics such as penicillin and aureomycin and other drugs. Acetate extrusion coated with polyethylene is a combination that is rapidly growing in popularity. When used for skin packaging, acetate-polyethylene reduces costs because inexpensive backing boards without perforations or adhesives can be used. This material also is used for some specialized wraps.

The continuing heavy trend to self service has been responsible for greater visibility requirements in packaging. Window boxes have done much to fill this demand. The crystal clarity of acetate provides the ultimate in product visibility while its dimensional stability makes possible neat, inviting packages that do not sag, wrinkle, cockle or fog. All types of durables, as well as fruit, produce, high-moisture baked goods such as fruit and meat pies, iced cakes, doughnuts and candy are all better merchandised when in window boxes that utilize cellulose acetate.

Cryovac*

by Ruth M. Power**

This article is concerned with a polyvinylidene chloride film known as Cryovac S. It is used as a bag and an overwrap material. (Another film known as Cryovac L refers to irradiated polyethylene. It is not included in this discussion.)

Heat-shrinkable Cryovac S bags have low permeability and are used for vacuum-sealing frozen foods of irregular shapes, particularly those requiring long freezer storage. Cryovac S film was developed to combine the highly protective and heat-shrinking qualities of Cryovac S bags in a form more economical and adaptable to fully automatic machine packaging.

The idea of vacuum packaging food in a shrinkable bag was first conceived in the early thirties by two French scientists, and later developed in this country. The name "Cryovac" is derived from the Greek "kryos" meaning cold, and the Latin "vacuus" meaning empty. As early as 1939, a natural rubber latex film in bag form, developed in this country, was used commercially. The critical shortage of natural rubber during World War II ended production of these bags, and in 1946 a new synthetic thermoplastic material was developed.

In making Cryovac S, the film is

*Cryovac is a registered trademark of W. R. Grace & Co., Cryovac Div. In this article it refers only to films made from polyvinylidene chloride resin blends.
**Food Technologist, W. R. Grace & Co., Cryovac Div., Cambridge, Mass.

stretched simultaneously in two directions and the molecules become oriented in directions parallel to the face of the film. As orientation nears completion, polymer crystals form instantaneously, locking the film molecules in position.

This molecular orientation accounts for the film's unusual shrink characteristics and produces a much stronger, tougher and more flexible film. The extruded materials are made into bags or casings, or slit into film, and multicolor flexographic printing is done as part of the manufacturing process. The outstanding feature of Cryovac S bags and film is the ability to shrink equally in all directions with high tension when exposed to heat. The film's free shrink is about 50% of its original dimensions.

Cryovac S bags have good contact clarity and are generally of heavier gauges than the film because they are used for packaging heavy or very perishable products. In process-packaging these bags, the product is inserted and the air is withdrawn from the bag by a vacuumizing device. The neck of the bag is twisted and fastened with an aluminum clip. The packaged product is then exposed momentarily to hot water (195-205 deg. F.), shrinking the bag to a tight wrinkle-free fit. Cryovac S film has the heat-shrinking quality of the bags but it is a clearer and thinner material.

Two different types of Cryovac S film are sold: one for handwrapping and the other specifically designed for use on automatic packaging equipment. Packages wrapped in either of the two film types can be heat sealed and then exposed to hot water or hot air for shrinking.

Cryovac S packaging materials are in effect chemically inert. Water absorption is negligible, and the permeability to water vapor, oxygen, and other gases is very low. The resistance to acids, alkalies (except ammonia), greases, oils and solvents is excellent. The films are completely nontoxic and impervious to odor transmission, and are adaptable to gas packaging as well as vacuum packaging.

Cryovac S films are dimensionally stable at ordinary temperatures and humidities, but long storage at temperatures over 75 deg. F. will cause a gradual decrease in shrinking ability. Packaging at room temperatures of below 40 deg. F. is not recommended, but once a product is packaged the film is not affected by freezer temperatures. Its resistance to sunlight is good. It is not flammable but self-extinguishing; it begins to soften and melt at 270 deg. F. Cryovac S bags and film, because of their low permeability, cannot be used for packaging products which require some gas transmission such as fresh fruits and vegetables. The vacuum process is not often used in film applications, and as a result the shelf life of products wrapped in film is less than if process-packaged in Cryovac S bags.

Cryovac S bags are vacuumized, sealed, and shrunk by the Cryovac packaging process to provide highly protective packages for many kinds of products. The "second skin" cling and low permeability of the bags provide unique, eye-appealing, and highly protective packages. Cryovac S film is adaptable to both hand or machine wrapping and is easily heat sealable as well as shrinkable. Most types of food products can be satisfactorily packaged in Cryovac S bags or film.

Pliofilm

by J. J. Tiernan*

Rubber hydrochloride, known and sold under the trade name of Pliofilm, was introduced in 1934 and was the first transparent film that could be heat sealed to provide a true weld-type bond. The history of this film shows numerous advances in modifying and adapting a range of types for different packaging chores. Recent advances are:

- A grade called SS-75 produced specifically for self-service meat packaging in supermarkets. It is intended for wrapping both fresh and frozen meats and it offers an important convenience feature in that the retail customer need not rewrap her purchases for freezer storage.
- A grade of produce-packaging film called Pliofilm 75 PNF. It is a high-breathing, perforated film with a nonfogging characteristic. It offers economy as overwrap, bag or band package for self-service items.
- A recent introduction called 65 BG Pliofilm for packaging of bread and other baked goods. It is a high sparkle, transparent film possessing a pleasant, soft touch. Its wide heat-seal range contributes greatly to its high machine efficiency.
- Still another type of Pliofilm, specifically designed for low moisture transmission, high grease resistance and good cling characteristics is being widely used by supermarkets to package cheese. This film substantially retards mold growth and retains enough moisture to give cheese longer life in stores and in homes.
- The increase in unit and portion-control packaging has created a demand for Pliofilm laminated to foil, paper, cellophane or acetate to make pouch and bag packages. The wide use of Pliofilm in laminations for this type of packaging is due to its excellent machinability, wide heat-seal range and freedom from pinholes. Other advantages are its relatively low WVTR and gas-transmission rates and its grease resistance. Pliofilm-laminated packages are used for yeast, dried foods, cosmetics, drugs and a host of other hard-to-keep items.
- Pliofilm liners for coffee bags, although not entirely new as a development, have important growth potentials because these bags keep pre-packaged coffee fresh and aromatic throughout the normal merchandising and home-storage period. They are much more economical than are rigid containers.

Pliofilm uses have not been confined to in-the-store wrapping alone. The film has been used for many years by packing houses in the packaging of both processed and smoked meats.



INTEGRAL Pliofilm-lined square-bottom paper bags made in-plant for ground coffee. Fresh taste and aroma preserved in the hermetically heat-sealed double-wall 1-lb. bags made from roll film and pre-cut paper blanks. Machine forms, fills and seals. (*Pliofilm, Goodyear Tire & Rubber Co.*)

Pliofilm is a plasticized and stabilized rubber hydrochloride which is cast from a solvent solution in a flat sheet onto a moving belt. It is then carried into driers where the solvent

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is evaporated. The resultant product is a transparent, homogeneous film.

Pliofilm is manufactured in three general classifications: the lower plasticized type designated by the suffix "N," the moderately plasticized group using the suffix "P," and the more heavily plasticized group which utilizes FF, HP, FM, FM-1 or SS. As the plasticizer content increases, so does the strength of the film, the water-vapor transmission rate and the gas-diffusion rate. The lower plasticized group has a quite low WVTR and gas-diffusion rate; medium plasticized group, moderate values; higher plasticized group, relatively high WVTR.

Pliofilm is recognized as an excellent heat-sealing film. There is no coating to act as a sealing medium. Instead, the Pliofilm actually seals to itself. A "welded" film-to-film seal is effected. Pliofilm has a wide sealing range (from 250 deg. F. to 350 deg. F.) permitting maximum machine efficiency with a minimum of waste.

The chemical properties of Pliofilm are the same for all types as far as water absorption, resistance to acids, alkalies, greases, oils, solvents and toxicity are concerned. However, WVTR and gas permeability vary with the type and gauge.

The water absorption of Pliofilm is negligible for all types. Prolonged exposure to high humidity atmosphere does not affect Pliofilm. All types of Pliofilm have good acid and alkali resistance. Many high fat- and grease-content products can be packaged in it for prolonged periods of time without any ill effects to the film or product. Certain essential oils will affect Pliofilm and, where present in a product, laboratory tests are essential.

Pliofilm is soluble in cyclic hydrocarbons and chlorinated solvents. These solvents can be used with low heat to effect seals on Pliofilm. Toluene, with a combination of low heat, can be used to solvent-seal Pliofilm.

Pliofilm is completely approved for food packaging of all types. It does not impart odor or allow passage of odor from one product to another.

The WVTR and gas diffusion rates of Pliofilm vary with the type and gauge of film. In the less plasticized type or "N" type, WVTR is as low as 0.5 gms. in a 24-hr. period per 100 sq. in. at 100 deg. F. and 90% relative humidity. Conversely, with the most highly plasticized type SS-75, the WVTR jumps to 15.5 gms. Oxygen diffusion for the "N" films is 4.8 cubic centimeters per 100 sq. in. in a 24-hr. period at 77 deg. F. In the SS-75 type, this rate jumps to about 420 cubic centimeters. There is, therefore, in between the two extremes, complete WVTR and gas diffusion ranges to meet specific requirements. Proper recommendations of film type must be obtained from the manufacturer.

The serviceable temperature range of Pliofilm varies according to type and gauge. All types of Pliofilm, however, soften at about 200 deg. F. Only the most heavily plasticized Pliofilm, HP, FM-1 and SS-75, are effective at subzero temperatures.

Pliofilm is dimensionally stable, and changes in humidity and temperature cause no wrinkling or shrinkage; low humidity will not shrink or draw the film or affect its strength. This makes for good window cartons, window lids and the packaging of any product exposed to high-humidity conditions, such as a self-service display item. Pliofilm has only fair resistance to sunlight. Prolonged direct exposure to ultraviolet rays causes film breakdown. But shelf life is sufficiently long for ordinary store use.

Ordinary storage precautions should be exercised and Pliofilm should be stored in a clean, dry place, avoiding temperature and humidity extremes. Temperatures around 65 to 70 deg. F. and relative humidity of 35 to 40% are best. Avoid storage near heat and direct sunlight.

Printing by rotogravure or flexography is accomplished quite readily.

Polyester

by Alan J. Thompson*

High strength, brilliant transparency and unusual protection—combined at practical cost—are the chief factors that have contributed to the expanding use of polyester film in the packaging field since it was introduced seven years ago. Because its properties can cope with extreme packaging demands, users apply it successfully and economically to improve package performance and to seize new packaging opportunities.

Three types of this material are manufactured in the United States.[1] Each has slightly different characteristics. The specific data in this article refer to "Mylar" film made from the condensation polymer of ethylene glycol and terephthalic acid. It is an oriented material, and the orientation produces a "balanced" sheet with uniform properties in all directions.

Seventy-five per cent of the polyester film used in packaging is currently in the food field—a large part of it in converted form as a lamination or extrusion-coated combination with polyethylene. This area has expanded greatly during the past few years because of the unique properties of this combination. These make it practical to package processed meat or pre-cooked foods in a transparent film pouch that will hold a vacuum, withstand shipping and handling, and protect the product until it is served—even through freezing and boiling.

Polyester film has a wide range of applications in non-food packaging that are about evenly divided between converted and unconverted film. It is used as a direct overwrap for paper products, textiles, toys, tobacco products, and as a bag for items where strength and clarity are important.

Polyester film is the strongest plastic film now available to packagers—a distinguishing characteristic. However, its most exceptional virtue as a packaging material lies in its total combination of balanced properties. These properties enable packagers to satisfy unusual requirements in one area without sacrificing desirable or necessary characteristics in another.

There are several types of polyester film designed for specific industrial applications, but only three varieties are of interest in the packaging field: (1) the standard uncoated form; (2) the heat-shrinkable type and (3) the polymer-coated type. The latter is the variety used for heat-sealing overwraps and bags and also for coating with polyethylene in some pouches.

Principal uses of polyester film in packaging take full advantage of the exceptional properties which accompany the film's optical clarity. As mentioned, it is used in fabricating pouches and other package forms for food products as well as hardware and other heavy and irregularly shaped merchandise. It also is utilized widely for windows in boxes and bags since it is tougher, more dimensionally stable and far more durable than acetate.

Another use which takes advantage of the film's durability is its application in bags or overwraps for merchandise (certain textile items, for in-

*Film Dept., E. I. du Pont de Nemours & Co., Wilmington, Del.

1 "Mylar" polyester film by du Pont, "Scotchpak" polyester film by Minnesota Mining & Manufacturing, and "Videne" polyester film by Goodyear Tire & Rubber.

stance) which tends to move slowly and requires packaging with long shelf life and continued resistance to customer handling. It is also ideal for protecting hygroscopic products, such as those made of paper, which tend to rob other wrappings of needed moisture or plasticizers.

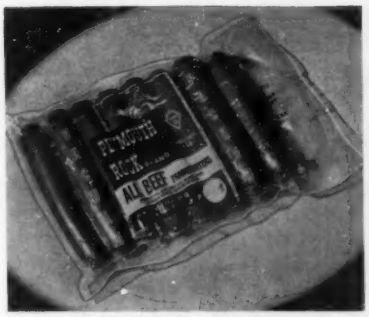
The film's capacity to withstand wide temperature ranges has made it suitable for "heat-in-the-pouch" packaging of pre-cooked foods. This development, which is expanding rapidly, utilizes a heat-sealed pouch of a material made from a half-mil of polyester film coated or laminated with a two-mil thickness of polyethylene.

Pouch-prepared meals can be pasteurized after packaging and soon may be prepared without being frozen, relying on gamma radiation for sterilization. Food processors have found that this pouch material has a functional edge over other pouch fabrications, and some report savings of as much as 50% over aluminum trays with foil overwrap. A great many pouch-packed, pre-cooked foods are currently on the market, with new ones being introduced constantly. It has been estimated that Americans will be consuming one billion "heat-in-the-pouch" meals a year by 1963.

The key to the popularity of these foods is their convenience. This factor looms as increasingly important throughout the food field, where the rising purchasing power of the average food shopper is making her more demanding about what she buys and the way in which it is packaged.

In several other areas, the low gas permeability of polyester film also is being exploited widely. This property plus durability and good appearance qualifies the film, when coated with polyethylene, as a material for vacuum and inert gas packaging. In this field, the film again changes the materials picture by combining durability with product protection and transparency. Using it, a processed-meat packer, for example, can package his product at the plant rather than at the retail level. His package will withstand shipping and handling, and the contents will retain their appearance and quality for a long period.

Another form of the film shrinks uniformly with the application of heat. When the shrinking is complete and the material has conformed to the shape of the product, the film still exhibits all the advantages of the standard polyester film. The heat-shrinkable variety is currently available in contour bags from several converters and in sheet or roll form from the manufacturer. It is being used for smoked meats and poultry.



VACUUM AND INERT GAS packaging for frankfurters uses polyester film coated with layer of polyethylene. Pouch has strength and durability, and guards against product fading. (*Du Pont photo*)

In skin-packaging applications, polyester film's durability plus its ability to hold a vacuum has resulted in long-lasting packages that can be formed quickly by machine. Packagers may use the film, coated with polyethylene, in a packaging process which both cuts costs, by eliminating the use of coated perforated board, and speeds production. It seals directly to most paper or paperboard and eliminates many of the usual film problems.

The single heat and vacuum cycle requires an average of only 10 seconds compared with 40 seconds required with other films. Although the film does not readily conform as closely to the shape of the product as some films, due to its high modulus, a simultaneous application of vacuum and pressure under heat can achieve quite close configuration. Skin-packaging applications have been chiefly in hardware and industrial fields.

Polyester properties

The general characteristics of this film are outlined in detail in the film properties chart on page 131. Its clarity is exceptionally good, on the order of that exhibited by the polymer-coated cellophanes. Due to its high modulus, it has sparkle and crispness even in the lighter gauges and contributes excellent appearance to a package. Its specific gravity and yield are in line with those of other commonly used films.

Film strength is an outstanding characteristic. Its average tensile strength of 20,000 p.s.i. is approximately twice that of cellophane and five times that of polyethylene. Elongation of 70 to 130% means that the film combines with its strength a resiliency that precludes some types of machine difficulties and improves durability and protective capacity.

Bursting and tear strength are slightly less than those of polyethylene film. Although polyester film tears rather easily—once a tear is started and pressure is continued—its toughness tends to prevent tears from being initiated in packaging applications, and punctures have no tendency to expand into tears unless external pressure is applied.

Extraordinary folding endurance is another characteristic of the film over the full range of temperatures and humidity (20,000 flexes in 1-mil film at zero deg. F.). Essentially, the film retains its physical properties over a range of —80 to 400 deg. F., with the result that it is virtually unaffected by temperature changes.

However, because of its resistance to heat, uncoated polyester film is not heat sealed satisfactorily by conventional methods. Yet, if benzyl alcohol is applied sparingly to one of the two film surfaces to be joined, a seal is made on standard machinery by subsequently applying heat at 325 deg. F.

Polymer-coated types of the film can be heat sealed in the usual manner, as can converted film which has been combined with a layer of polyethylene. Other sealing methods in special instances include the use of hot wires and, for heavier gauges, electronic or ultrasonic sealing. Adhesives satisfactory for use with the film also are available commercially.

Since no plasticizers are used, the film does not become brittle or lose its desirable properties with age. It is produced in continuous sheets and is available in roll or sheet form in widths from ½ inch to 55 inches, and in gauges from ¼ mil to 10 mils. The most commonly used gauges for packaging are ½ and 1 mil.

The film is approved by F&DA, provided processing temperatures after sealing do not exceed 250 deg. F.

Since polyester film absorbs, under test, less than 0.5% moisture when immersed in water at 25 deg. C. for one week, its physical and mechanical properties remain essentially constant regardless of relative humidity.

Dimensional stability is another property which extends over a wide range of temperatures. Exposed to a

temperature of 150 deg. C. for 30 minutes, the film shrinks less than 2%. Under conditions normally encountered in packaging, dimensions of the film are not affected by external influences. The result is a smooth wrap that does not wrinkle or pucker.

Exposure to artificial light also brings no adverse results. Under extreme exposure to outdoor sunlight for protracted periods, some degradation may be expected, but this is not a significant factor in packaging.

In gauges of 1 mil and greater, polyester film handles well on conventional machines, provided the sealing requirements previously mentioned are observed. The ½- and ¾-mil films may pose some difficulties on standard machinery normally designed to handle heavier materials, but can be run with special care and the use of machine adaptations that have been developed. Also, thin gauges of polyester film coated with polyethylene are sufficiently thick to run easily.

Printing of polyester film is accomplished readily on standard presses with readily available inks.

Polypropylene

by Ralph M. Winters*

Polypropylene films made substantial commercial advances during 1961, moving out of the area of packaging laboratories and developmental testing and into actual large-poundage commercial usage.

By far the greatest quantity of this new commercially available film was of the unoriented variety and used in the baking industry, primarily for overwrapping white bread and some specialty breads such as rye, whole wheat and the like.

The advance of polypropylene film in 1961 was triggered by the Food & Drug Administrations's 1960 sanction of the film for various food uses. This edict, on which polypropylene producers had been working for some time, helped open the doors for commercial production and application of the film.

While this unoriented polypropylene film was just beginning to establish itself after several years of research and development, major polypropylene film manufacturers already were moving another step ahead by announcing characteristics and properties of oriented film—of both the biaxial and unilateral types.

Unoriented film

The growth of unoriented film can be attributed to the advantages which it offers the packager. Its important properties are summarized: excellent gloss and clarity; low WVTR; medium to high permeability to gases; excellent grease and chemical resistance; high melting point, permitting higher use temperatures; unlimited flex life; high tear and tensile strength; heat sealability; and good machinability properties on many types of wrapping equipment.

Furthermore, its theoretical barrier properties are not affected ordinarily by handling, creasing, package fabrication, or changes in humidity or temperatures, as some of the common coated materials are. Its density is the lowest of all plastic films, which permits the highest yield in square inches per pound of all plastic packaging films. As a result the cost per thousand square inches is relatively low. (See cost table, p. 17.)

Unoriented polypropylene is printable, using the polyamide-type and some alcohol-type inks. It can be printed by either the flexographic or rotogravure methods. Reverse printing is especially attractive because of the film's excellent optical qualities.

Most of the common heat-sealing methods used for other thermoplastic films can be applied to polypropylene. (See heat sealing article and table in Section 12.)

Polypropylene has an easily controllable heat-seal range. This range will vary with the types of package, packaging speed, dwell time, pressure, type of machine and other conditions, but it has been found, in laboratory testing and field applications, that heat sealing is not critical when the film is run on machinery designed for thermoplastic films.



POLYPROPYLENE bread wrapper for Ward Tip Top loaves combines the advantages of strength, clarity, machinability and low cost. Film provides increased water-vapor protection for the jumbo-size loaf. (*AviSun polypropylene*)

Polypropylene has a stiffness at least 40% greater than medium-density polyethylene and twice as great as low-density polyethylene, This provides superior feeding and folding on automatic equipment. Rewraps due to poor folds are reduced to a minimum, for better packaging economics.

Because of the stiffness and increased "body" of polypropylene, thinner gauges can be handled successfully on automatic machinery when compared to some of the relatively limp polyethylenes.

Although the greatest amount of polypropylene has been used in the bakery industry for bread and sweetgoods wrapping, it also is being consumed for such items as wrapped valentines and gift-wrap paper. It is being used for packaging textiles and toys on pouch-forming machines, and in bag form for food items such as macaroni. As a bag liner, it is interesting in applications such as packaging cookies and dog food where grease resistance and low WVTR are needed.

In addition to polypropylene's advances as a packaging material by itself, developmental work by converters has resulted in successful laminations of polypropylene with polyester, cellophane, aluminum foil and various papers and boards.

Oriented film

While the unoriented film has much to recommend it, the advent of oriented film offers even more unique and interesting properties as a packaging material. Information and data available on the various oriented films, announced so far, stem mostly from developmental work, although some market testing has been undertaken in areas such as produce bags, bag liners and candy packaging.

Oriented polypropylene film is produced by stretching the film under carefully controlled conditions. This effects the molecular alignment that produces the properties that are so unique when compared to unoriented film. It can be stretched in one (unilateral) or both (biaxial) directions, each variety producing slightly different properties. Most of the field work so far has been done with the unilateral type film.

Utilizing a broad rule of thumb,

* Manager of Market Development, AviSun Corp., Philadelphia, Pa.

biaxially oriented polypropylene film just about doubles the desirable properties of unoriented film. For example, stiffness and tensile ratings of oriented film are more than double those for regular polypropylene.

Also, WVTR and gas barrier properties are about twice as good as the values for unoriented film. This means that the same barrier properties can be achieved with ½-mil oriented film as with 1-mil unoriented film. Gloss and clarity are as good as with any film available to the industry. Oriented polypropylene can be printed with the use of the polyamide-type and some alcohol-type inks.

Oriented polypropylene is not normally considered to be a heat-sealing material because its melting point, though high (330 deg. F.), is rather sharp. It also will tend to shrink above 250 deg. F. Some packaging equipment has been developed that will heat seal oriented polypropylene, and it can be run on some types of overwrap equipment which have been designed to accommodate thermoplastic films. It is easily machinable on many types of machines because of its excellent slip and stiffness. Adhesives are available that can be used for bag making and laminating. The biaxially oriented film can be used as a shrink wrap. Cold weather breakage is greatly minimized by both the unilaterally oriented and biaxially oriented films—the biaxial variety being the best.

The oriented varieties of polypropylene are being evaluated as tapes, overwraps, adhesive-sealed bags and bag liners, and for use in window cartons and window envelopes.

Polypropylene as a packaging material has come a long way in a rather short time and, with increased emphasis on development by resin and film suppliers, machinery manufacturers and the converting industry, it promises to offer much more.

Oriented polystyrene

by R. J. McCormick*

Ever since the introduction of the first low-cost polystyrene film to the packaging industry, its use for packaging applications has continued to expand because of its physical properties and its low cost.

Polystyrene resin is extruded into a film and is stretched to predetermined ratios in transverse and longitudinal directions at controlled, elevated temperatures. This biaxial stretch orients and aligns the molecules into a more orderly pattern and gives the film increased strength and toughness.

The absence of plasticizer in polystyrene film, coupled with its inability to absorb more than a negligible amount of moisture, is responsible for the excellent resistance to dimensional change and the outstanding indoor aging characteristics exhibited by the film. Polystyrene film cannot dry out and become brittle with age or when exposed to low humidity conditions. It is, therefore, ideal for products packaged several months prior to use or which require long shelf life.

The mechanical properties of polystyrene film are for the most part dependent upon the orientation placed in the film during its manufacture. The chart on page 131 lists a number of these properties. The tensile strength and bursting strength are relatively high. The film exhibits no appreciable grain effect. Although the tear strength is low, it is somewhat difficult to initiate a tear and punctures do not readily tear unless external stress is applied. Exposure to cold temperatures or humidity extremes has no appreciable effect on physical properties. The film will begin to shrink when heated to temperatures in excess of about 185 deg. F.

The rate of water-vapor transmission of polystyrene film is relatively high, but it is considerably lower than that of cellulose acetate. The gas transmission rate also is high. It is therefore suitable for packaging produce items and other products which must breathe in order to maintain their quality.

The quality of printing which can be obtained on polystyrene film using conventional printing techniques is excellent. The appearance of reverse printing is further enhanced by the excellent clarity and gloss of the film. The film is an ideal base for metalizing because of the almost complete absence of volatiles. Extremely good luster and metal-to-film bonds have been obtained.

Both emulsion adhesives and solvents are used for bonding polystyrene film to itself with satisfactory results. The heat sealing of polystyrene film is complicated by certain problems including the loss of physical properties and shrinkage of the film in the seal area because of a disorientation caused by the application of heat. Satisfactory seals can be obtained using some of the polyethylene overwrap equipment recently made available. Also, sealing with hand irons such as are used in supermarkets is said to be satisfactory in overwrapping meats and produce.

Polystyrene film is available in thicknesses ranging from 1 mil and up and in widths up to 72 inches. Its low price on an area basis (see p. 17) makes it an economical film.



POLYSTYRENE film is used for these window packs of bacon. Advantages lie in a combination of strength, clarity and economy. (*Dow Chemical photo*)

Saran

by F. C. Dulmage*

A packaging film with low gas and water-vapor transmission rates is needed for many of today's packaging requirements, especially for protection against flavor loss or contamination and against moisture loss or gain. Saran films are well known for these protective qualities as well as for chemical resistance, sparkling clarity and strength.

The name saran applies to a family of unusual thermoplastic resins based

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*Manager, Technical Service & Development, Film Section, The Dobeckmun Company, Cleveland, Ohio; a Div. of The Dow Chemical Company.



SHELF LIFE of cheese increased with ¾-mil saran (oriented) which protects it against moisture, oxygen, gases, foreign odors, drying. Black background, gravure printing. (*Printon Corp. photo*)

on chlorine and ethylene. Saran film is a copolymer of vinylidene chloride and vinyl chloride.

The resin is extruded in tube form and is immediately quenched in a cold-water bath to keep it in an amorphous state. The tube is oriented by continually blowing it into a large bubble. This yields a highly flexible, strong, tough film.

Saran film is produced in two basic types—numbers one through 19 and numbers 20 through 59. Formulations one through 19 contain the highest percentage of vinylidene chloride. They exhibit superior barrier properties and chemical resistance. Formulations 20 through 59 are more flexible at low temperatures and exhibit more stretch with greater shrinkability.

The optical qualities of saran are outstanding. Although the film transmits 90% of the visible light, it has a high ultraviolet cutoff. This is an important property in protecting many products, such as processed meats.

Saran cannot generally be heat sealed in the same manner as cellophane or some of the other thermoplastic films. This is due in part to its relatively sharp melting point as well as its tendency to shrink under heat. Electronic sealing eliminates this problem. Many automatic bag machines as well as other fabricating and filling equipment now seal saran by the electronic method.

Not all packaging applications call for a true seal or weld. For example, natural cheese, luncheon meat and certain box overwraps are very satisfactory with a peel-type seal.

Since the moisture absorption of the film is negligible, humidity is not a factor in storage. Best storage conditions call for storage at less than 110 deg. F. Saran film has a very low water-vapor transmission rate.

Saran is an excellent gas barrier; thus, it retards rancidity and extends the shelf life of many products. This property is also of value in vacuum and gas packaging.

The resistance of saran to oils and greases is outstanding. Its chemical resistance to dilute and concentrated mineral acids, with the exception of concentrated nitric and sulphuric, is excellent. Alcohols, aliphatic hydrocarbons, pharmaceuticals, detergents and organic acids generally do not affect the film. Good resistance to most organic solvents and alkalies, with the exception of ammonium hydroxide, is generally exhibited. Tetrahydrofuran, aromatic ketones, and aliphatic ethers are about the only solvents which attack the film.

It is resistant to intermittent dry heat at temperatures up to 200 deg. F. and it exhibits excellent resistance to moist heat at temperatures as high as 270 deg. F. It stiffens and loses some of its flexibility at low temperatures.

It can be printed by flexographic and rotogravure methods. Double-wound (two-ply) film can be trap printed so as to lock the printing between the two films. This not only prevents product contamination and scuffing of the printing, but it also adds considerable sparkle and depth.

Large quantities of luncheon meat are machine overwrapped in saran. Machines also can package processed meats, chili, cheese, meat sauces, sandwich spreads and salads in chub or link type packages. Wedge-shaped cheese packages can also be automatically machine overwrapped. Certain types of candy are packaged in saran bags and an excellent job of flavor protection results. Because of the properties mentioned and the machines available, saran film is finding wide acceptance as a good film for packaging use.

Vinyl films

The vinyl films may be composed of resins of vinyl chloride alone or blends of vinyl chloride, vinyl acetate and other resins and the films can be made by either of two widely different methods. Because of the large number of possible combinations of resin, plasticizer and other components, an extremely wide variety of films may be produced ranging from hard, brilliant films which approach cellulose acetate to the soft, flexible films similar to polyethylene. They may also be produced in a variety of colors and embossed finishes and are capable of being printed in multicolor. Vinyl films, thus, have a range of characteristics which are useful in packaging.



NEW multipacking operation uses heat-shrunk film overwrap—oriented polyvinyl chloride film—for packaging refrigerated biscuits. The labels retain their eye-catching sales appeal through the clear film. (*Reynolds Metals Co. photo*)

One method of making vinyl film uses the familiar procedure of casting a film from solvent solution or a dispersion of the resin followed by removal of the solvent or fusion. The other method consists of heating the resin so that it becomes plastic and producing a film by squeezing between hot rolls (calendering) or forcing through a flat or circular orifice under pressure (extrusion).

The solvent casting technique has the advantage of being able to make very thin films although improvements in the extrusion process are continually making rapid strides in this direction. Solvent casting can make films from a wider range of base resins and resin formulations, since it is not dependent upon the heat stability or heat-flow characteristics of materials. However, for many uses care must be taken to select the proper plasticizer-resin combination to meet toxicity, odor and taste requirements, or to prevent migration of plasticizer if the film is in contact with other resins, adhesives, finished surfaces, etc.

The vinyl films are characterized by

their ability to make strong heat seals using a number of processes. There are certain precautions, however, which must be taken in order to guard against sticking to some types of heat sealers.

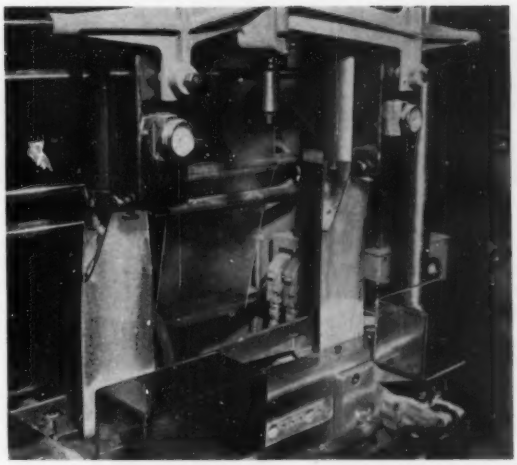
Specialty and new films

Water-soluble films. There is a continuing interest in water-soluble films as unit packages for soaps, bleaches and detergents and similar household products. The two candidate materials are polyvinyl alcohol and methyl cellulose. Both make clear, strong films that can be heat sealed in a moist condition and both have a range of water solubilities.

The expanded uses for these films appear to depend on determining the uses and packaged products that need their unique property.

Nylon films. There are many resins of the nylon or polyamide type that are capable of being converted into film form.

In general, the nylon resins produce films that are both clear and very strong. However, they do have the disadvantage of relatively high resin cost, and the films do not possess any outstanding or unique physical or protective qualities. The nylon films also have high heat-sealing temperatures. These films have low gas permeability, but they have very high water-vapor transmission.



WATER-SOLUBLE polyvinyl-alcohol film pouches are produced in volume, resulting in an economical soluble package of hard-to-handle combined detergent and bleach powder. Cross-sealing section is a key element of modified pillow-type pouch-forming machine. Air-conditioned room controls handling of film which tends to stretch and become sticky in high humidity. (*Mono-Sol film*)

Fluorohalocarbon film

by Frank Clark*

Plastics experts know well the distinct physical and chemical properties that can be built into a plastic resin by including fluorine in its structure. One completely fluorinated polymer performs at temperatures as high as 520 deg. F. and as low as −392 deg. F. It stands up to harsh corrosive chemicals where metals, ceramics and other plastics fail. It meets the needs for specialized electrical applications because of its zero moisture absorption and its extremely low moisture permeability—the lowest of any flexible thermoplastic.

But while possessing these outstanding traits, it has not been used in general packaging operations. Reason: methods for fabricating it differ from those normally used for ordinary and familiar packaging thermoplastics, and its cost level encourages first consideration for more economical materials. However, there are certain highly specialized protective demands that make fluorcarbon film useful.

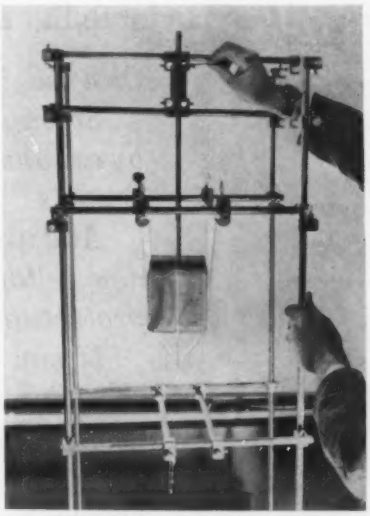
By substituting certain fluorine atoms on the carbon chain with another halogen, a new, brilliantly transparent thermoplastic is obtained—one that brings to the plastic engineer a material which in film form can be fabricated and processed on equipment generally used in packaging. When laminated to or extrusion coated with other materials, a package medium results that can be handled by the usual machines for filling, forming, sealing, packaging and overwrapping, and at acceptable production speeds.

Fluorohalocarbon film, when specially treated, seals with selected adhesives. Even untreated film seals with one permanent-type adhesive. It can be heat sealed and printed, vacuum formed and processed to achieve effects comparable to those of other thermoplastics. Dimensionally stable, it offers high dielectric strength.

Fluorohalocarbon film could play a serious role in transparent packaging of drugs, cosmetics, corrosive chemicals, lubricants, and military components. Many such items cannot be packaged adequately in any other transparent film. A brief look at some of the film's other features points up its usefulness: nearly complete chemical inertness; flexibility in liquid nitrogen; compatibility with liquid oxygen; sterilizability by steam, irradiation, and chemicals; zero moisture absorption; and fantastically low permeability to moisture vapor. Add to these features the fact that it keeps most of its useful properties over a 700 deg. F. range.

Fluorohalocarbon film is available in thicknesses from ¼ mil to 30 mils. Yield in a 1-mil gauge is 13,000 sq. in. per lb. Cost range is $6 to $10 per lb. depending on various factors.

F&DA acceptance for use with drugs must be determined separately for individual products. Fluorohalocarbon is not approved for direct use with foods but can be used as an exterior ply in combination with accepted films.



HIGH IMPACT STRENGTH of fluorohalocarbon film is being test-demonstrated. A 15-lb. weight is dropped 10 inches into a bag made of the film. This is one of many tests to qualify film to meet stringent requirements in the military specification MIL-F-22191. (*Allied Chemical photo*)

*Technical Service, General Chemical Div., Allied Chemical Corp., New York City.

Who developed

a cellophane with greater transparency than any other?

a cellophane that heat-seals at lower temperatures than any other?

a cellophane that cuts meat wrapping costs up to 10%?

a cellophane that keeps potato chips and other high oil-content foods saleable 50% longer?

a cellophane that withstands sub-zero temperatures for months without shattering?

a cellophane that is completely impervious to grease?

a cellophane that gives tough, tight wraps for the largest, boniest cuts of meat?

a cellophane that keeps cupcakes, pound cakes and jelly rolls fresh 12 days instead of 7?

a cellophane that stays clear and sparkling under constant refrigeration?

a cellophane that assures maximum resistance to cockling?

a cellophane that combines greater economy, stability and durability than any other?

Olin did.

Strong claims? Of course, but each is backed by exhaustive laboratory tests or actual customer reports.

And we're working constantly to develop other new cellophanes to give your product maximum protection and sales appeal.

If you have a cellophane packaging problem, see your Olin representative or converter. We probably have just the cellophane to meet your specific needs. If not, chances are, we're already working on it.

PACKAGING DIVISION Olin

FILM OPERATIONS, 460 PARK AVE., NEW YORK, N.Y.

PROPERTIES OF PACKAGING FILMS

Basic types of films and accepted commercial standards used in packaging are given here. There are, however, many special grades available. For materials more than 0.003 in. thick, see "Characteristics of Molded Plastics" and "Characteristics of Sheet Plastics" in Section 8. A chart on papers is in Section 3 and a chart on foils is elsewhere in this section.

Names of manufacturers and suppliers of transparent films, and their addresses, appear in the Buyers' Directory at the back of this book.

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PROPERTIES	Cellophane		Pol
	Lacquered	Polymer-coated	
GENERAL			
1. Type of material	Lacquered regenerated cellulose (heat sealable)	Polymer-coated regen. cellulose (heat sealable)	Ex c
2. Forms available	Sheets, rolls	Sheets, rolls	She
3. Clarity	Transparent or colored	Transparent	Trans tran
4. Thickness, in.	0.0009-0.0017	0.001 to 0.0014	0.002
5. Maximum width, in.	60	46	
6. Yield[1]	19,500	19,500	11,80 comb
7. Approximate specific gravity	1.40-1.55	1.44	
MECHANICAL			
8. Tensile strength, lb./sq. in.	7,000-16,000	7,000-13,000	5,000
9. Elongation, %	15-25	25-50	15
10. Impact strength,[2] Kg-cm.	8-15	5-15	10
11. Tear strength (Elmendorf) gm./mil	2-10[5]	7-15	16
12. Stiffness, grams (Handle-O-Meter[3])	MD 37-65 TD 18-31	MD 37-65 TD 18-31	40 20
13. Heat-sealing range, deg. F.	200-300	225-350	230
CHEMICAL			
14. Water-vapor permeability,[4] gm./24 hr./100 sq. in. at 100 deg. F., 90% R. H.	0.2-1.0	0.5-0.9	1
15. Permeability to gases (oxygen, carbon dioxide)	Dry: very low[6] Moist: variable[6]	Very low	Like ce
16. Resistance to acids	Poor to strong acids	Poor to strong acids	Exc
17. Resistance to alkalies	Poor to strong alkalies	Poor to strong alkalies	Exc
18. Resistance to greases and oils	Impermeable	Impermeable	Like pol
PERMANENCE			
19. Maximum use temperature, deg. F.	Begins to char at 375	Begins to char at 375	1
20. Minimum use temperature, deg. F.	Depends on type and R. H.	About 0	Depe cello
21. Dimensional change at high R. H., %	3-5	2-3	3
22. Flammability	Same as newsprint		Slow
CONVERTING CHARACTERISTICS			
23. General machine performance	Excellent	Good	Exc
24. Printability	Excellent	Good	Like co
25. Sealing	Heat or adhesive	Heat	H
26. Heat shrinkable	No	No	N

1 Value in sq. in. per lb. per mil (0.001 in.) of thickness, where not otherwise indicated.
2 See "New Pendulum Impact Tester," MODERN PACKAGING, Nov. 1956, p. 163.
3 Instrument is described in Federal Specification UUP-556-E for toilet tissue.
4 Using $CaCl_2$ in test dish. Values reported are based on 1 mil (0.001 in.) of film. Value for some films c
5 Figures represent pull to tear after starting. Force to start tear is too high to measure on some equipme
6 Depends on moisture content of film and type and amount of plasticizer.

phane						Poly	
ted	Polyethylene-coated[7]	Cellulose Acetate[9]	Cryovac	Pliofilm	Polyester	Low density 0.910-0.925	M
ted ose le)	Extrusion coated	Cellulose acetate	Saran resin blend	Rubber hydrochloride	Polyester resin plain or coated	Polyethylene resin	Poly
s	Sheets, rolls	Sheets, rolls	Seamless tubes, bags, films[10]	Continuous rolls, sheets	Sheets, rolls	Roll, sheets, tubing	R
t	Transparent to translucent	Transparent or colored	Transparent to opaque or colored	Transparent to opaque	Transparent	Transparent to translucent or colored	T t
014	0.002 or more	0.0005-0.002	0.0008-0.003	0.0004-0.0025	0.00025 & thicker	0.0005 or more	0.0
	60	52	Variable	60	50-55	240	
	11,800 (2-mil combination)	22,000	16,700	24,000	20,000 to 25,000	30,000	
	1.2	1.25-1.35	1.64	1.11	1.15-1.39	0.92	
0	5,000 & over	7,000-12,000	6,000 to 12,000	5,500-7,500	17,000 & higher	1,350-2,500	2,
	15-25	15-50	50-100	Yield 10-20 ultimate 350-500	70-130	50-600	
	10-20	2-8	10-25	6-15	25-30	7-11	
	16-50	2-15	15-20	60-1,600	13 to 80	150-350	
5	40-60	25-40	Depends on	12-25	40	MD 2.5-4.5	
	20-40	25-45	type	12-25	40	TD 3-7	
	230-300[8]	350-450[8]	275-300[8]	250-350[8]	275-400[11]	250-350[8]	
	1.2	100	1.0-1.4	0.5-15.0	1.0	1.2	
	Like cellophane	Medium	Very low	Low to high	Very low	High	M
ng	Excellent	Poor to strong acids	Excellent	Good	Excellent	Excellent	
ng	Excellent	Poor to strong alkalies	Good, except ammonia	Good	Excellent	Excellent	
ble	Like polyethylene	Excellent	Excellent	Excellent	Excellent	May swell slightly on long immersion	
har	180	Approximately 300	Softens at 270, melts at 290	Softens at 200	230	180 (softens at 230)	
	Depends on cellophane	Brittle at subzero	Depends on plasticizer	Depends on plasticizer	—80	—60	
	3-5	0.6% at 80% R. H.	None	None	None	None	
	Slow burning	Slow burning	Self-extinguishing	Self-extinguishing	Slow burning	Slow burning	Sl
	Excellent	Good	Special machines	Poor to good	Good	Poor to fair	F
	Like cellophane	Excellent	Good	Special inks	Good	Good if treated	Go
	Heat	Adhesive	Heat or clamp	Heat	Adhesive	Heat	
	No	No	Yes	No	Some types	Special types	

ated.

lue for some films depends on type and amount of plasticizer.
e on some equipment and normally is not determined.

7 Cellophane-coated or la
8 Unsupported film canno
9 Modified acetates—cellul
10 Properties here are for 400-1100—c.c./24 hrs.
11 This applies to coated

	Polyethylene					
nsity .925	Medium density 0.926-0.940	High density 0.941-0.965	Polypropylene	Polystyrene (oriented)	Saran	Vinyl
resin	Polyethylene resin	Polyethylene resin	Polypropylene resin	Polystyrene resin	Polyvinylidene chloride	Vinyl chloride, copolymers and plasticized combinations
ts,	Rolls, sheets, tubing	Rolls, sheets, tubing	Rolls, sheets	Rolls, sheets	Seamless tubes, rolls	Rolls
t to nt d	Transparent to translucent	Transparent to translucent	Transparent to translucent	Transparent	Transparent, translucent, opaque	Transparent
nore	0.00035 or more	0.0005 or more	0.00075 or more	0.001 or more	0.0005-0.002	0.0005 or more
	240	60	60	72	40	72
	29,500	29,000	30,677	26,100	16,300	21,600
	0.93	0.94 and up	0.90	1.05	1.68	1.23-1.35
00	2,000-3,500	3,000-10,000	6,600-7,800	9,000-12,000	8,000-20,000	2,000-11,100
	50-500	5-400	200-600	10-20	40-80	5-500
	4-6	1-3	1-3	1.5	12.0	12-20
)	50-300	15-300	40-330	20-30	10-20	Varies widely
4.5	MD 5-10 TD 6-14	MD 8-16 TD 10-20	MD 11-27 TD 11-27	50 50	10 15	7.5-40 10-45
8	240-350[8]	275-350[8]	325-400[8]	250-325[8]	280-300[8]	200-350[8]
	0.5-1.0	0.3-0.6	0.5-0.7	4.4	0.10-0.30	3.5-13
	Medium to high	Medium to high	Medium to high	Medium to high	Very low	Medium
t	Excellent	Excellent	Excellent	Good	Excellent, except H_2SO_4 and HNO_3	Excellent
t	Excellent	Excellent	Excellent	Good to excellent	Good except NH_4OH	Excellent
ightly ersion	Good	Excellent	Excellent	Good	Excellent	Excellent
at 230)	180-220	230	250	Shrinks at 185	Softens at 290, melts at 310	Approx. 200. Depends on plasticizer
	—60	—60	—60	Subzero	Good flexibility at 0	Depends on plasticizer
	None	None	None	Little or none	None	None
ning	Slow burning	Slow burning	Slow burning	Slow burning	Self-extinguishing	Self-extinguishing
air	Fair to good	Good	Fair to good	Good	Fair	Poor to good
ated	Good if treated	Good if treated	Good if treated	Special inks	Special inks	Special inks
	Heat	Heat	Heat	Heat or adhesive	Heat	Heat or adhesive
pes	No	No	Some types	Yes	Some types	Some types

hane-coated or laminated with 1-mil polyethylene. Test data assume polyethylene side toward product.
ported film cannot be sealed on all types of heat sealers. Special sealing may be necessary. See heat-sealing chart in Section 12.
ed acetates—cellulose acetate butyrate (Kodapak II) and cellulose triacetate (Kodapak IV)—offer an additional range of properties.
erties here are for bag material. Film type varies in certain properties: elongation 50-110; WVTR, 0.29-0.80; permeability to O_2, 75-250; permeability to CO_2 1100—c.c./24 hrs./sq. meter/atm/mil @ 72 deg. F.
applies to coated grades only.

See other side for chart "How to Identify Packaging Films"

HOW TO IDENTIFY PACKAGING FILMS

For the most effective use of this chart, first observe these steps:

1. Classify film as to *Stretch* or *Non-stretch*. Use Stretch Test, illustrated extreme right.
2. Classify *Non-stretch* film as *Non-melt* or *Melt-easy* with burnt match test. Further classify *Non-melt* with Tear and Water Tests as indicated in chart.
3. Classify *Non-stretch, Melt-easy* films, using **Shrink and Burn Tests, illustrated extreme right.**
4. Classify *Films that Stretch* with Crumple and Burn Tests, illustrated extreme right.

In order to test laminations, the plies must be separated.

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***MELT TEST*—TOUCH HOT EXTINGUISHED MATCH TO FILM[2]**	***TEAR TEST*—SLOWLY**
Hot end of extinguished match pressed against film does not push through readily. Film resists melt; chars	No rubber-li

***MELT TEST*—TOUCH HOT EXTINGUISHED MATCH TO FILM[2]**	***SHRINK TE*: 1 INCH FR**
Hot end of extinguished match pressed against film readily pushes through the film. The film melts readily and does not resist penetration. There is no tendency to char	Shrinks viole into deep w
	Little shrink is held near

***COLOR TEST*—CRUMPLE FILM INTO BALL; OBSERVE COLOR**	***DRIP TEST*—TAPER; LIG**
White or silver color is observed in crumpled ball of clear transparent film	Burns with d
	No molten d
	No molten d
Yellowish gray or green	Edge tacky v

1 Basic information for these tests developed by Avisco. Tests should be regu

NON-STRETCH—NON-MELT FILMS

TEAR TEST—NICK FILM; TEAR SLOWLY	*WATER TEST*—PLACE DROP OF WATER ON FLAT FILM	*FILM IDENTITY*	A C
No rubber-like stretch at tear	Drop flattens and spreads, softening film	CELLOPHANE, NON-MOISTUREPROOF	C st w p y
	Non-spreading, sheds readily. Film is non-absorbent	CELLOPHANE, MOISTUREPROOF	
Rubber-like stretch occurs at point of tear		CELLOPHANE, POLYETHYLENE COATED	

NON-STRETCH—MELT-EASY FILMS

SHRINK TEST—HOLD FILM 1 INCH FROM MATCH FLAME[2]	*BURN TEST*—HOLD LIGHTED MATCH CLOSE TO TOP CORNER OF FILM[2]	*FILM IDENTITY*	A C
Shrinks violently and rapidly into deep wrinkles	Self-extinguishing. Film has pungent, burning odor	POLYVINYLIDENE CHLORIDE (SARAN)	S H sa
	Burns with sooty flame. Sharp odor	POLYSTYRENE	P re
Little shrink observed when film is held near flame	Burns slowly leaving beading or roll at edge. Odor of acetic acid, burning paper	CELLULOSE ACETATE	C h
	Does not burn readily. Shrinks with no charred edges	POLYESTER	P Ir

FILMS THAT STRETCH

DRIP TEST—ROLL FILM INTO A TAPER; LIGHT END[2]	*BURN TEST*—ROLL FILM INTO A TAPER; LIGHT END[2]	*FILM IDENTITY*	A C
Burns with drip, leaving molten drops	Burns rapidly. Hot paraffin odor	POLYETHYLENE	P sp to
No molten drip	Burns very little with only white smoke	POLYPROPYLENE	Si g
No molten drip	Burns with charred edge. Self-extinguishing. Black smoke. Pungent, hydrochloric odor	POLYVINYL CHLORIDE (VINYL)	V to
Edge tacky when cooled	Burns moderately; green edge at flame. Self-extinguishing. Hydrochloric, rubber smell	RUBBER HYDROCHLORIDE (PLIOFILM)	Pl H

sts should be regarded only as a rough guide. Laminations can be tested only when plies are separated.

2 CAUTION! Make tests only in

APPEARANCE AND PHYSICAL CHARACTERISTICS
Cellophanes are sparkling, smooth, have stiffness, tear easily. Burn like paper, with wood smoke odor. Coated cellophane will not stick when touched to your lips.



STRETCH TEST
Films generally divide into two groups: stretch and non-stretch types. Mark off 1-inch on edge of film. Hold against ruler. Pull to determine whether film stretches to any extent. Test adjacent edge, too, for film may not exhibit stretch both lengthwise and crosswise.

APPEARANCE AND PHYSICAL CHARACTERISTICS
Saran is sparkling clear; limp; clings. Hard to tear. (Cryovac responds to saran tests)
Polystyrene is clear, sparkling film; is relatively stiff; has metallic rattle.
Cellulose acetate has sparkle, is smooth, has stiffness. Easy to tear.
Polyester is transparent, smooth, crisp. Intermediate tear resistance.



SHRINK TEST
Non-stretch films that melt easily (touch with extinguished hot match) fall into two classes: those that shrink little; those that shrink violently. Hold film 1 inch from lighted match in ash tray to determine shrink.[2]



BURN TEST
Films identify themselves by odor, drip, smoke or similar characteristics when burned. Roll film into a rope and light end. Observe for drip, smell, smoke, charred edges.[2]

APPEARANCE AND PHYSICAL CHARACTERISTICS
Polyethylene is soft. Can be hazy to sparkling clear. Stretches easily. Hard to tear.
Similar to polyethylene, but tends to greater clarity, strength, stiffness.
Vinyl is clear. Varies, soft to stiff. Hard to tear. Self-extinguishing.
Pliofilm is clear. Varies, soft to stiff. Has rubbery feel. Hard to tear.



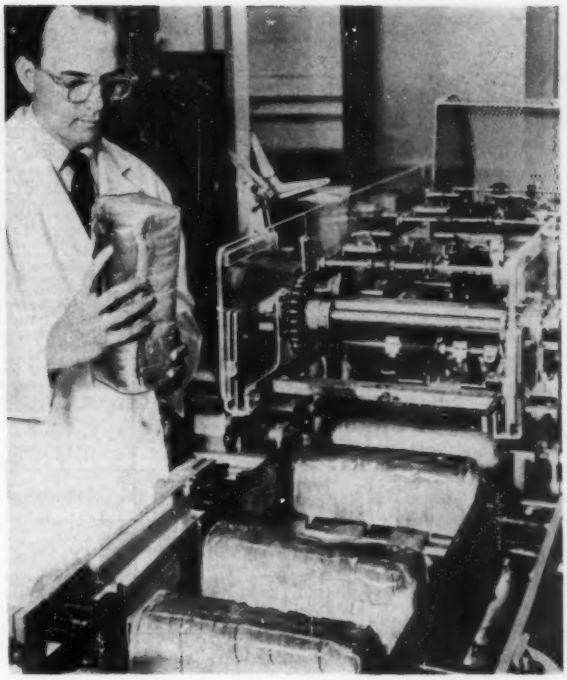
CRUMPLE TEST
Some stretch-type films classify themselves by color when crumpled. Make a ball of the film and observe whether color is white, yellowish or green.

only in safe atmosphere; avoid hazards and molten drip.

See other side for chart "Properties of Packaging Films"



EXTRA PROTECTION and freshness retention are provided by new twin pack. Two cellophane wrapped inner packs hold pretzels firmly, keep out moisture. Tough outer bag of specially-constructed film gives added protection and serves to prevent bag failure. (*American Viscose photo*)



MORE CELLOPHANE AT SAME COST. New higher yield cellophane for breadwrapping and tobacco products has same high runability and protection as lesser yield types. A 19% yield increase was made in polymer-coated breadwrappings. (*Du Pont photo*)

CELLOPHANE — present and future

by Herbert C. Horst*

Cellophane continually has proved to be an extremely adjustable material, capable of responding—through base sheet modifications and coating variations—to the most exacting, vigorous and often exciting demands of the packaging field. Introduced in this country in 1924, the film has experienced both subtle and dramatic improvements in great variety. The properties resulting from these changes have produced truly new packaging materials that are better tailored to meet the changing requirements of the market place.

This progress will continue, and the packaging customer can expect the introduction of an expanding array of new cellophane types and combinations that will increase the use of this film in present markets and open new markets. One current example is the introduction of higher-yield cellophanes this year, which increased the number of square inches per pound of film from 5 to 19% over former levels—thus lowering the square-inch, or per-package, cost of the film.

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Cellophane is a regenerated natural cellulose material. It is readily changed by modifying the base sheet or varying the coating material.

Because of its adjustable nature, cellophane is not merely one film but an entire "family" of films, each tailored to a specific packaging need. In addition, combinations of cellophane and other materials—such as extruded polyethylene—now add even newer and more practicable dimensions to the packaging scope of this film.

A significant step in the use of cellophane for packaging came this year when the Food & Drug Administration confirmed the safety of cellophane by giving its approval to those types being sold for use in food packaging.

The selection of the proper cellophane type for a specific packaging application is dependent upon the intelligent appraisal of a variety of considerations. Among these are: (1) packaging machine requirements, (2) shelf-life needs, (3) storage and handling conditions (including climatic exposure), (4) merchandising requirements, (5) economic considerations.

Cellophane is available commercially in more than 100 different varieties. All types have varying degrees of a basic set of characteristics, tailored to satisfy the requirements of particular packaging applications. These properties emphasize the all-around capabilities and unique balance of qualities that enable cellophane to meet precise needs.

Moisture protection. This property is available in varying degrees and is part of the broad basis for categorizing cellophane types. Plain, uncoated cellophane is, of course, non-moistureproof. Cellophane that is either nitrocellulose-coated or polymer-coated is moistureproof, having a permeability range of 0.2 to 1.2 units, depending on the type of coating. (See properties chart, p. 131.) Polymer-coated films have a higher level of moistureproofness than nitrocellulose-coated types and retain their moistureproof properties better after handling or upon contact with oily and fatty products. Intermediate moistureproof cellophanes are produced for certain products requiring moderate moisture protection.

For greatest protection against moisture, as well as increased durabil-

Characteristics for some of the newer types of cellophane*

FUNCTIONAL OBJECTIVE	DESIGNATIONS[1]	TECHNICAL TREATMENT	SPECIFIC PACKAGING TARGETS	COST (PER 1,000 SQ. IN.)
High yield 22,000 sq. in./lb.	220 MS-10, 26, Avisco 220 MSD-60, Du Pont 220 MST-44, 60, Olin	Improvements in manufacturing and coating to decrease thickness for higher yield	Direct wrap for bread and other bakery products containing grease. Tray and small carton overwraps.	$0.0282
25,000 sq. in./lb.	250-K-201, Du Pont 250-V-401, Olin 250-RS-1, Avisco	Polyvinylidene chloride copolymer coating. Good chemical resistance. Highest yield.	Direct wrap for bread	0.0316
Toughness and durability	116-RS, Avisco 116-K-202, Du Pont	Polyvinylidene chloride copolymer coating.	Wraps or bags for heavy or sharp-edged food items such as cookies, crackers, pretzels, nuts and candies.	0.0733
	140-T-69, Avisco	Cellophane-polyethylene-cellophane lamination with two-side nitrocellulose coating.		0.0700
High barrier	103-K-203, Du Pont	Heaviest gauge cellophane, polyvinylidene chloride copolymer coating.	Bags or wraps for cookies, crackers, pretzels and candy.	0.0825
	140-T-79, Avisco	Cellophane-polyethylene-cellophane lamination with two-side polyvinylidene chloride copolymer coating.		0.0785
Controlled permeability	REO, Avisco MSAD-90, Du Pont OF-18, Olin	Polyethylene coating.	Direct and tray overwraps for fresh red meats.	0.0433
Chemical resistance	RS-1 & 2, Avisco K-201, 202 & 203, Du Pont OX-511, 513 & V-401, 402, Olin	Polyvinylidene chloride copolymer coating.	Direct wraps and bags for foods containing high levels of grease, oils, salt and sugar, such as cakes, nut meats, potato chips, cookies, dried fruits and candies.	0.0316 to 0.0564
Oxidative rancidity retardant	OF-20, Olin	Nitrocellulose coating with antioxidant combination.	Foods with high oil or shortening contents: potato chips, nut meats, cookies.	0.0295 to 0.0443
Color type meeting F&DA specifications	K cellophane FC	Non-migratory colors, sealed in with polyvinylidene chloride coating.	Direct wraps for any food product, moist or dry.	0.0419

* Many of these films are already standard or are becoming so. See also table of standard types.
[1] NOTE: Different makes of films designated in this column may be comparable but are not identical.

ity, double-wall construction often is advisable.

Heat sealability. This property forms the other basis for categorizing cellophane types, since cellophane is produced either to seal, or not to seal, by application of heat. The formulation of the coating on cellophane determines the sealability, which may be varied in its strength to fit specific packaging requirements. Strong seals are possible through a wide range of temperatures, facilitating simple fabrication of packages at high speed.

It is important to note that, when cellophane is heat sealed, only the coating is softened to make the seal, while the base sheet remains unaffected. Homogeneous plastic films, on the other hand, tend to soften all the way through, thus making a "weld" type of seal—desirable in simple seals but a problem in multiple folds.

Adhesive sealability. All cellophane types, coated or uncoated, may be sealed with conventional adhesives.

Appearance. Sparkling visibility and extreme clarity are possessed by all cellophane types. The connotation of neatness and cleanliness that this affords in a package, as well as the clear view it provides for the product, is responsible for much of the impact that cellophane has made on self-service shopping.

Runability. Cellophane has demonstrated repeatedly its ability to perform well on high-speed packaging machinery. Its surface slip, coupled with its relative stiffness, enables easy handling on "push-feed" machines at extremely high rates of speed. In addition, the factors of surface slip, stiffness, and sealing characteristics can each be modified to tailor a cellophane for a particular machine application.

Printability. The easy running of cellophane on common printing equipment also is a distinct advantage. It may be printed by rotogravure, flexography or letterpress methods. Because of its high gloss and sparkle, reverse printing often is used for extra merchandising impact.

Gas barrier properties. Both nitrocellulose-coated and polymer-coated



MOISTUREPROOF overwrap for meats. Polymer-coated cellophane was designed to withstand shrinking, cockling and shattering, especially under freezing conditions. (*Olin Mathieson photo*)



EXTREME CLARITY and sparkle of polymer-coated cellophane combined with rigidity offered by its thick gauge make an attractive and durable bag for candy and nuts. (*Du Pont photo*)

cellophanes provide an effective barrier against gases, such as oxygen, at low levels of relative humidity—when the film is dry. But under high humidity conditions—or when the film is used on wet products—the oxygen transmission rate of some of the nitrocellulose-coated types may increase as much as tenfold. It is this unique property that is used to advantage in the packaging of fresh meat where a high oxygen transmission rate must be coupled with low water-vapor permeability to retain the meat's color.

Under high humidity, however, polymer-coated cellophane is relatively unaffected. This accounts, in large part, for the rapidly increasing use of this film as a base sheet for extrusion coating with polyethylene in the area of vacuum and inert-gas packaging of such items as cheese and processed meats. The gas-barrier properties of polymer-coated cellophane—which result in greater retention of flavors—also give it wide acceptance as a barrier material to line paper bags for coffee and flour mixes.

In addition, cellophane has other properties that may be varied to fit particular packaging applications:

Pliability or "hand" of the sheet (soft types for twist wrapping, flexible varieties for bag making)

Thickness of the cellulose base material (resulting in the final gauge thickness of the film)

Placement of the coating (on one or both sides)



PRINTED transparent cellophane overwrap keeps thread clean, shows off bright colors and provides sparkling display. (*Olin Mathieson photo*)

Anchoring or bonding of the coating to the base sheet for effective adherence under moist conditions

Coloring of the film. (Special types introduced in 1961 contain colors that are non-migratory and, therefore, are not considered food additives by the F&DA. These types may be used for packaging food products.)

An illustration of the importance of these subtle changes in the formulation of cellophane is found in the variety of types used by the baking industry. Moistureproof cellophane that keeps white bread fresh and flavorous would turn hard-crusted French bread soggy. Conversely, the type that allows moisture to pass freely and keep the French bread crisp would dry out white bread. Between these two extremes, glazed doughnuts and iced sweet rolls require a cellophane with controlled, intermediate water-vapor permeability to keep them properly protected.

The degree of oxygen permeability is another important difference among cellophane types. For instance, the cellophane used to retain the bloom and color on fresh red meats would allow luncheon meats to discolor under normal display conditions. On the other hand, the cellophane best suited for luncheon meats would allow a fresh steak to become discolored.

No single cellophane type or single set of properties can do the best packaging job in every case; so, among cellophane's many different types, a specific one is tailored to the precise needs of each job.

An important development is the introduction of polymer coatings. For many products, a polymer-coated cellophane provides a greater degree of sparkling appearance, smoothness, moisture protection, durability and resistance to oil and grease than is

Standard types of cellophane*

DESIGNATION			CHARACTERISTICS	TYPICAL USES
Avisco	Du Pont	Olin		
Intermediate moisture protection				
DS	LSD	LST	Partially moisture protective; heat sealing; average durability.	For sugared doughnuts, to control moisture loss and prevent drying and sogginess.
DSB	LSAD	LSAT	Partially moisture protective; for use on wet or moist products; heat sealing.	Wraps for luncheon meats, fresh fruits, vegetables.
MSBO	MSAD 80	OF-16	Protects wet products; one side wettable.	Fresh meat wraps. Retards discoloration.
Moistureproof nonheat-sealing				
M-1	MD 31	MT 31	Low WVTR. Sealed with lacquer-type adhesives or nitrocellulose solvents and low heat. Impermeable to dry gases; low permeability to water-soluble gases.	For wrapping cigarettes, carton overwraps and cigar tubes — when adhesive or solvent seals are desired and not a heat seal.
MB	MAD 2	—	Standard moistureproofness, water resistant, durable at low temperatures.	Laminations, liners in frozen-food cartons.
Moistureproof heat-sealing				
MS-1	MSD 51	MST 51	Good moistureproofness, flexibility; average durability.	Bread wraps; twist wraps on small objects.
MS-2	MSD 52	MST 52	Good moistureproofness, durability and flexibility.	Carton overwraps; direct wraps for greasy products, high-fat-content cakes.
MS-3	MSD 53	MST 53	Good moistureproofness; high flexibility and durability, particularly at low humidities, low temperatures.	Extra durability bags; puncture-resisting wraps; bags for frozen foods (dry pack).
MS-4	MSD 54	MST 54	Good moistureproofness. Extra durability.	Laminations, carton overwraps.
MSB-6	MSAD 86	MSAT 86	Good moistureproofness; strong heat seals; good water resistance.	Direct wraps on wet products for strong heat seal. Special laminations, carton liners.
MSB-7	MSAD 87	MSAT 87	Good moistureproofness; strong heat seals; water resist ng; highly flexible; durable at low temperatures, low humidities (cold, dry climates).	Direct wraps or bags for frozen foods; liners, wraps for frozen-food cartons; bags resistant to water, oils, gases, etc.

* This tabulation represents only a partial list of types manufactured by each company. The corresponding types of cellophane cannot be considered exact equivalents, since processes and coating formulations vary according to manufacturer. However, characteristics and performances, as indicated, are largely similar. See table, "Cellophane Designations," in this article. For fuller listings, including plain, nonmoistureproof types and range of gauges, consult suppliers (see Buyers' Directory in back of book).

available from standard nitrocellulose-coated materials. The vastly improved resistance to fats and oils makes these types particularly effective for packaging baked goods, candy, potato chips, crackers and biscuits. Practically all cracker and biscuit manufacturers use polymer-coated cellophanes on at least some of their products and, in the baked goods industry alone, it is estimated that packaging in polymer-coated cellophane will attain an annual rate of more than half a billion units in 1961.

In addition, the durability of polymer-coated cellophanes makes them less affected by handling and machining than nitrocellulose-coated types.

Handling and storage of cellophane is one of the keys to its successful use. Since the film is a cellulosic product instead of a homogeneous plastic material, it is hydrophilic and, as such, is subject to changes in moisture. The best conditions for storing and handling cellophane are at 35 to 50% relative humidity and room temperature (70 to 75 deg. F.)—although, if rolls are still protected by their original wrapping or are rewrapped well after partial use, the humidity level is less important than the temperature.

Cellophane yield and thickness

Typical gauges		Square inches per pound	Thickness, inches
New[1]	Former[2]		
250[3]	—	25,000	0.0008
220[3]	—	22,000	0.0009
210	300	21,000	0.0009
195	300	19,500	0.0010
182	300	18,250	0.0011
140	450	14,000	0.0014
116	600	11,600	0.0017
103	600	10,300	0.0019

[1] Indicates first three digits of yield (number of square inches per pound).
[2] Number once was approximate weight of one square meter in decigrams.
[3] Types introduced in 1961 and assigned only the new gauge designation.

Shipment or storage in extremely cold or dry conditions, as an example, will affect the handling characteristics of cellophane, and proper precautions should be taken in handling the film during or after exposure to such conditions. Incoming shipments that have been in transit during zero or subzero weather, for instance, should be stored 24 to 48 hours under recommended conditions to allow the cellophane to reach proper temperature and humidity before being run on packaging machinery.

Film that has been exposed to excessive dryness may be reconditioned by storage under recommended conditions for a period of time.



CELLOPHANE OVERWRAPS protect bananas against abusive handling. Tiny holes in film permit escape of respiratory gases. (*American Viscose photo*)

To assure the best performance of cellophane for a particular packaging job, the potential user should give his film supplier as much information as possible about his product, his machine operation and his shelf-life needs.

In the future, the growth of cellophane packaging will reflect the influences of two vital packaging factors: the market place (its needs, trends and product developments) and the adjustable nature of the film by itself or in combination with other materials.

Combinations of cellophane with papers, foils and plastic materials already have opened new flexible-packaging possibilities for vacuum and inert-gas packaging of a wide range of foods and hygroscopic products, flowable materials and heavier units. In the case of extrusion coating of polyethylene onto cellophane, the gas-barrier properties and sparkling appearance of cellophane are teamed with polyethylene's strength and its ability to hold an air-tight heat seal.

For use in coating, there is a variety of substrate cellophanes available to converters to help meet exacting package requirements. The most recent of these is uncoated on one side and non-heat-sealing in its standard coating on the other side. This new cellophane type, designed to fill a precise need, seals on the inside extruded-polyethylene surface but does not stick to the outside of other pouches when stacked in heated condition.

Another new type for coating use has an unusual ability to enable strong adhesion of the polyethylene coating to the cellophane.

The whole field of polyethylene-coated cellophane is one that will have great bearing on cellophane's contributions to packaging. Virtually unknown a few years ago, these film combinations now are commonly used in pouch and bag form for attractively protecting many varieties of food. In the last year, use of these film combinations has more than doubled. And, with new fields for these materials —such as candy, frozen-dessert items and other foods—on the horizon, it appears they will keep on growing.

Another packaging trend seems to be the strong growth in portion and fractional packaging. From five packs of cigars to individual servings of frozen foods and potato chips, the field is keeping pace with other developments in convenience packaging.

Increased protection for the product also seems to figure prominently in the future of cellophane packaging. It appears that new cellophanes, and cellophane combinations, will make important contributions in this area—due, again, to the film's adjustable nature and the extended advantages reaped by combining it with other materials.

Currently, the nation's cellophane producers have large research staffs working on still further improvements and modifications of the basic cellophane sheet. This work is designed not only to provide greater—and more adjustable—protection of food products and more durability for the package, but also to develop even better runability of cellophane on higher-speed packaging equipment.

Market development specialists, on the other hand, are responding to packaging needs by investigating the use of cellophane in areas that may have been considered impractical, or even impossible. These include currently such fields as those where rigid containers have been considered the only answer to packaging problems—in ice cream, for instance, where some 88 million gallons are sold annually.

Cellophane designations*

Type of film	Avisco	Du Pont	Olin
Anchored water-resistant coating	B	A	A
Colored	C	FC[1]	—
Polyvinylidene chloride coating	RS	K	OX & V
Ethylene coating	RE	90[2]	OF-18
Intermediate moisture-proofness	D	L	L
Moistureproof	M	M	M
Heat-sealing	S	S	S

* Additional symbols are: Avisco — O for one-side coated; Du Pont — D for Du Pont film; Olin uses T for transparent.
[1] Designation indicates approval by Food & Drug Administration for packaging food products.
[2] Full designation is MSAD-90.

ALUMINUM FOIL

by Ross C. Reed* and James E. Stillwagon**

Foil's popularity is attributable to its versatility and to the continuing gains that are made in producing better foils and in using them even more advantageously.

Several strong trends call for an increasing consideration of aluminum foil in packaging to provide:

1. *Superior protection*, particularly for newer types of products that may be frozen, dehydrated, vacuum packaged or portion packed. Foil provides many of the properties needed for the more exigent requirements encountered in this type of packaging.

2. *Greater economy*. The squeeze on profits has intensified efforts to reduce costs with more efficient operations, lighter weight, reduced spoilage, easier handling and longer shelf life. Foil has many properties that lead to efficiency and economy in modern packaging practice.

3. *Increased selling power*. Upgrading appearance and quality through attractive packaging is a factor so vital to fast buying decisions and better acceptance that foil offers premium advantages wherever it can be used appropriately.

4. *Convenience*. Packages must do more jobs in the store and in the home or wherever used. Consequently, greater durability, better barrier properties, more resistance to heat or cold and often special physical or functional characteristics are wanted. Foil is one of the prime materials to consider when special performance is required.

Examples of gains being made in the use of foil can be found in pouch packages for unit packs, or gas packs; laminated paper cans for fruit concentrates, motor oil and the like; and in the use of new alloys such as 1100 alloy foil, which has improved flex properties. An advance that promises additional advantages to packagers is the development of coatings that will adapt foil surfaces for printing by lithography. At present gravure and flexography are the major foil-printing methods. Lithography can broaden opportunities for packagers by providing quality effects in medium or small runs.

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Basic foils

Aluminum foil is employed in all forms of packaging including flexible packaging materials, semirigid and rigid containers. It may be used alone or in combination with other materials, particularly when the thinnest gauges are employed. It may be used solely for function or for appearance, but best usage takes advantage of both its "working" and decorative characteristics.

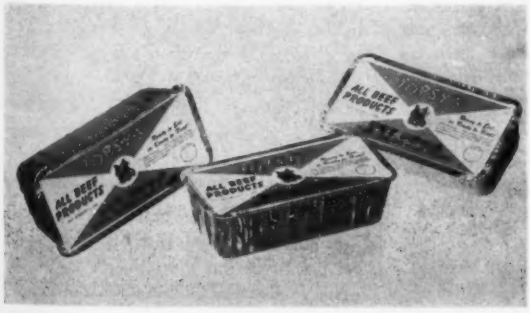
Once considered a precious metal, aluminum is now one of the most economical metals available. Because of its ductility, aluminum can be rolled to very thin gauges within close tolerances. It thus provides relatively large covering areas and its light weight in many applications yields economies with respect to shipping costs.

Foil is produced in a variety of alloys, tempers, gauges and finishes. In the packaging field, the most common alloys are 1145 and 1100 for flexible packaging materials, and 3003 for applications requiring higher mechanical properties. The 1145 alloy has a minimum purity of 99.45% aluminum.

The most generally used tempers are the annealed, known as soft foil and indicated by -0, and the as-rolled, or hard foil, designated —H19. The annealed foil has higher ductility but lower tensile properties than the as-rolled foil. The annealed or soft foil is characterized by its dead folding properties which are desirable particularly in flexible applications where form-fitting folds and convenient reclosure may be needed. Conversely, as-rolled or hard foil possesses spring-back and rigidity and is commonly used in formed containers. The as-rolled foil also has a more lustrous surface than annealed foil.

Foil by definition has a maximum thickness of 0.0059 inch. It is available in gauges as thin as 0.00017 inch. The thinnest gauge foils are commonly combined with other materials such as paper or plastic films to increase strength and, in many cases, to take advantage of other properties provided by the material with which the foil is combined. The thinner gauges of foil are used in flexible materials such as overwraps and pouch structures. The thicker gauges of foil are used for more rigid structures such as foil trays and pans and drawn containers. (See also the article on foil containers, p. 343.)

Foil in gauges of 0.001 inch and lighter is generally produced with one surface bright and one surface dull. This is a result of pack-rolling, in which two webs of foil are rolled simultaneously. The foil surface which contacts the polished steel rolls be-



LEAKPROOF foil pan with reclosable paperboard top met need to pack frozen dog food so it can be heated, stored. (*Ekco-Alcoa photo*)



PAN package (right), foil laminated on the inside, saves production steps for bakery. Batter goes directly into it; baked cakes go to overwrap machine. (*Marathon photo*)



AN INSULATOR that reflects radiant heat, foil was chosen for this multipack beer carrier to create a "Cold Pack." Designed for picnics and outings, it sells well for home use, too. Consumers like its eye appeal and the convenience of its tear-tab opening. (*Reynolds Metals photo*)

comes the bright surface, whereas the matte, or dull surface, is produced where the two webs of foil contact one another. Foil, in the heavier gauges, may be obtained with an embossed surface.

Annealed foil is supplied with a clean, oil-free surface. A small amount of residual rolling lubricant is present on the surface of as-rolled foil. In cases where this residual lubricant is objectionable, the foil can be cleaned by various methods, such as solvent cleaning, chemical cleaning or scratch brushing.

In packaging, a pure aluminum surface is rarely encountered; instead a hard, tenacious aluminum oxide coating is present. This oxide coating enhances certain chemical properties and contributes to the excellence of aluminum in packaging various products. Although the chemical resistance, as a result of this oxide coating, is exceptionally high, there are materials such as alkalis and certain acids that will attack the oxide coating and also the aluminum beneath the coating. In some applications, conditions exist that will cause localized corrosion and lead to rapid failure of the structure. In case of doubt, tests should be conducted to determine whether or not a corrosive environment will be involved. When corrosion does occur, it usually can be overcome by applying a suitable protective coating to the surface of the aluminum. (See article on coatings for metal containers, p. 347.)



QUALITY image projected by foil wrap attracted candy maker in packaging for wider distribution of their higher-priced chocolate bars which were previously sold unwrapped by candy chain. (*Milprint photo*)

Packaging properties

Aluminum foil is impermeable to moisture, gases, odors, light, organic solvents, grease, oils and other liquids. In gauges below 0.001 inch, very small holes may be formed in the foil during rolling. Although these holes, commonly referred to as pinholes, are microscopic and varied in size, they permit permeation of some moisture, gases, liquids, grease and oils. Because of the very small area which they present, however, the amount of transmission through these holes is small and may be blocked by adhesives and coatings. As the gauge increases, the number of holes decreases. At a thickness of 0.001 inch the transmission of water vapor becomes zero. Improvements in rolling techniques have led to continued reduction in the number of pinholes formed in the thin gauges of foil, leading to improved protection with thinner gauges of foil and resultant economies.

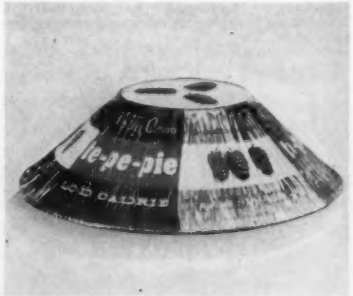
Because aluminum foil is unexcelled as a *moisture barrier*, it is used to package those products requiring a high degree of protection against moisture loss or gain. For example, the quality of dehydrated soups, potatoes and milk is assured through the protection afforded by aluminum foil. It is also the best *gas and vapor barrier* available. Thus it is used in packages for aromatic products such as moth crystals and essential oils so that volatile substances will not be lost to the atmosphere. It is used to protect sensitive products such as bleaches and chemicals against atmospheric oxygen and carbon dioxide. In gas packaging, foil is used to retain an inert atmosphere in the package. Products sensitive to stray odors, such as butter, oleomargarine and chocolate candy, are protected through the use of aluminum foil. Foil also will prevent the loss of aroma from such products as coffee, spices and tobacco.

Because it is *impervious to light*, aluminum foil is used extensively to package chemicals, drugs and foods that are light sensitive.

Resistance to grease and oil. Foil



LAMINATION of acetate, vinyl and foil not only gives excellent moisture protection to dry salad mix but also allows eye-catching design on pouch surface for more effective point-of-purchase displays. (*Dobeckmun photo*)



PLEATED, truncated cone of foil, crimped over aluminum pan, lends crushproof, moistureproof, colorful protection to pies, now easily stackable. (*Kaiser Aluminum photo*)

is used in pouches, wound paper cans and in a variety of carton structures that must contain greasy or oily products, such as caulking compounds, biscuit doughs, pastries and ointments. Foil not only is a good grease barrier but it is also a good wrap or label material for products that may be exposed to oil or grease. Aluminum foil will not stain and also is easy to keep clean.

Aluminum's *reflectivity* and *conductivity* can be applied in many areas to improve the functional properties of packages. For example, in packaging various frozen products, an aluminum foil-board carton provides a structure that maintains the product under a more uniform storage condition in the freezer, particularly during the defrosting cycles which freezer chests undergo periodically. This is because the aluminum surface reflects up to 95% radiant heat. Aluminum foil is also used extensively in insulated bags for carry-home service of frozen products and hot prepared foods. In the case of the latter, the foil provides a grease barrier as well as insulation.

Since foil will cool quickly and heat rapidly, it makes possible many packaging applications involving both freezing and baking.

Hygienic characteristics. The annealing conditions to which the foil is subjected are such that any bacteria that might be present on the surface are destroyed. Plain aluminum will not support bacteria, mold or fungus growth. This makes the foil ideally suited for packaging foods and various sterile products. Aluminum is *nontoxic, odorless* and *tasteless,* and as a result lends itself well to food, drug and other critical packaging applications. Aluminum foil is *dimensionally stable* against changes in humidity. It is noncombustible and it also is nonabsorptive.

Laminations. Aluminum's versatility is not limited to the properties inherent in the metal itself but can be enhanced by combining it with other materials. Usually, foil is laminated to paper by the process known as "wet mounting," in which the bond is made before the adhesive dries. Foil also may be laminated to paper with wax. In some structures the wax serves as a laminant and as a strike-through heat-sealing medium.

Foil laminated to paper, plain or printed, is used for wraps, labels, overwraps, bags and case liners.

Table I—Typical foil thicknesses, yields and weights

Thickness		*Yield*		*Weight, lb./ream 24 x 36 (480)*
Inches	*Millimeters*	*Sq. in./lb.*	*Sq. ft./lb.*	
0.00025	0.00635	41,000	285	10.1
0.00035	0.00889	29,200	203	14.2
0.00050	0.01270	20,500	142	20.2
0.0010	0.02540	10,250	71.3	40.5
0.0015	0.03810	6,800	47.2	60.9
0.0020	0.05080	5,100	35.4	81.3

With plastic films, a technique known as "dry bonding" or thermoplastic laminating is used. In this case, since both the foil and film are impervious to the solvents used in the adhesive, the adhesive must be applied to one or both of the surfaces and dried before lamination is effected. The adhesive, being thermoplastic in nature, is activated by heat and the bond between the film and foil is produced under the pressure of combining rolls. (See also p. 149.)

Coatings are applied to the surface of aluminum foil to provide a heat-sealable surface, to protect against chemical attack and mechanical abrasion, to decorate, to lubricate, to promote adhesion or to provide release properties. Several of these properties may be combined in one coating. Coatings fall into various categories including lacquer, hot melt, latex and extrusion coatings. (See also p. 94.)

Extrusion coating of foil with polyethylene has achieved some degree of popularity. The combination of these two materials provides an excellent packaging material. In applications requiring a strong, durable bond between the polyethylene and the foil, the foil may be coated with an adhesion promoter. Polyethylene may be used to combine foil with paper in applications as low as 0.2 or 0.3 mil. Foil-paper laminations with better protective properties and better printing and embossing qualities result when polyethylene is used as the laminant.

Aluminum foil and foil laminates can be printed by the conventional printing processes which include gravure, lithography, flexography, letterpress and screen. In some cases, annealed foil may be printed directly; however, to assure satisfactory adhesion of the inks and overlacquers to the foil surface, prime or wash coatings are generally used. These coatings will vary with the type of printing process used. For example, a shellac wash coat is commonly employed when printing by gravure or flexography.

For lithography and letterpress processes, vinyl or nitrocellulose prime coats are commonly used. These coatings are usually applied more heavily than shellac because of the nature of the inks used in these processes. This heavier application has the advantage that white inks print whiter and eliminate the need for a second lay-down to provide the desired whiteness.

The brighter finish obtained with as-rolled foil provides a surface that is particularly desirable from the standpoint of appearance. However, the small amount of residual rolling lubricant on the foil surface poses adhesion problems even with the wash coats used for the printing processes. Primer coatings are being developed to provide satisfactory printing on hard foil surfaces without additional treatment such as solvent or chemical cleaning of the foil.

Embossing produces a pleasing effect with foil and may be done on plain foil or on foil in combination with other materials. When the foil is laminated, care must be exercised to choose laminations for the embossing operations that will retain desired depth in the embossed pattern. Certain adhesives and films possess memory and as a result do not permanently deform during embossing operations.

Table II—Bursting strength

Nominal thickness, inches	*Mullen bursting strength, lb./sq. in.*	
	Min.	*Max.*
0.0008	8	15
0.0010	11	21
0.0015	22	37
0.0020	40	60
0.0030	75	100

Properties—aluminum foil and laminations*

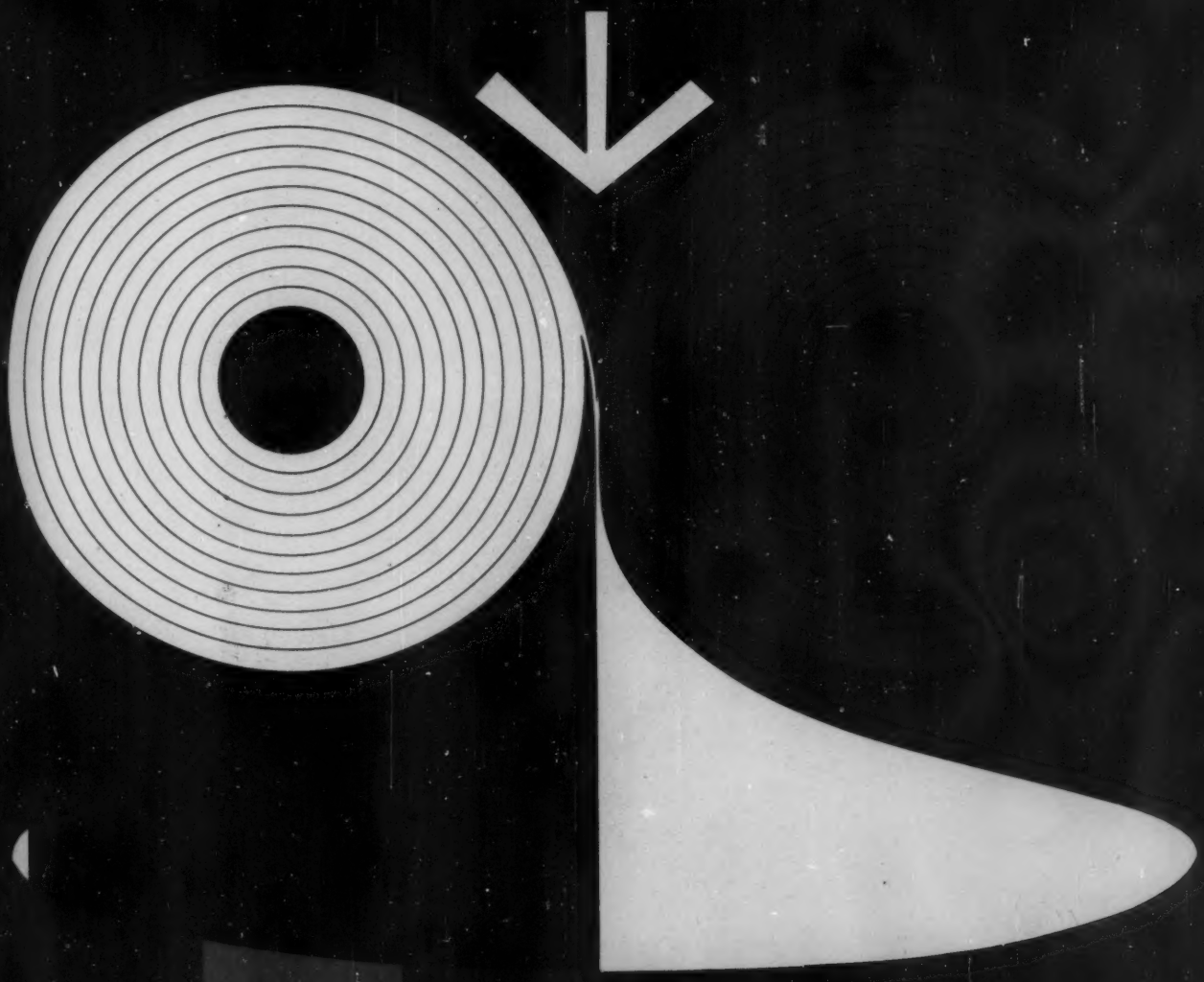
Properties	Metal foil	Specialized aluminum-foil combinations—heat-sealing types				
	Aluminum	*Foil–paper–foil combination, heat-seal coating*	*Foil–water-resistant adhesive–paper–microcrystalline wax–porous tissue*	*Cellulose acetate–resinous adhesive–foil–heat-seal coating*	*Paper–waterproof adhesive–foil–heat-seal coating*	*Scrim–polyethylene–foil–vinyl film combination*
General						
Forms available	Rolls, sheets	Rolls, sheets, bags	Rolls, sheets, bags	Rolls, envelopes	Rolls, envelopes	Rolls, pouches
Clarity	Opaque	Opaque	Opaque	Opaque	Opaque	Opaque
Thickness range, in.	0.0002-0.006	0.003	0.0044	0.0025	Approximately 0.005	Approximately 0.016
Maximum width, in.	54	–	–	–	36	36
Area factor, sq. in./lb. (approximations)	10,250 for 0.001 29,200 for 0.00035	5,500	6,500	5,900	4,800	2,660
Approximate specific gravity	2.7	–	–	–	–	–
Mechanical						
Tensile strength, lb./in., TAPPI #T-404M	9-118	29	19	21	23	35
Elongation, %, TAPPI #T-457M	2.1-26	2.7	2.9	2.4	1.6	11.5
Bursting strength (Mullen), lb./sq. in.	4-165[1]	39	19	50	47	130
Tearing strength (Elmendorf), gm.	5-425	60	15	40	135	880
Seal strength (Suter), lb./in.	–	3	1	2	4-5	5-6
Folding endurance (MIT)	4-18	154 at 1 kg.	55 at 1 kg.	240 at 1 kg.	–	–
Chemical						
Water absorption in 24-hr. immersion, %	Zero	–	–	–	Zero	–
Permeability to gases	Negligible	Negligible	Negligible	Negligible	Zero	Zero
Water-vapor permeability (Southwick-Rhoades), gm./24 hr./100 sq. in.	Negligible	Negligible	Negligible	Negligible	Negligible	Zero
Resistance to acids	Poor to good	Poor to good	Poor to good	Poor to good	Good	Poor
Resistance to alkalies	Poor to good	Poor to good	Poor to good	Poor to good	Good	Poor
Resistance to greases and oils	Excellent	Excellent	Poor	Poor	Good	Good
Resistance to organic solvents	Excellent	Affected by some solvents	Affected by some solvents	Affected by some solvents	Affected by some solvents	Affected by some solvents
Permanence						
Resistance to heat, deg. F. (limiting temp.)	700	120	120	120	120	160
Resistance to cold, deg. F. (limiting temp.)	—120	Depends on laminating agent, etc.	Depends on laminating agent, etc.	Depends on laminating agent, etc.	—65	—65
Resistance to sunlight	Excellent	Excellent	Excellent	Good	Excellent	Excellent
Dimensional change at high R.H., %	None	None	None	None	None	None
Resistance to storage	Unaffected	–	–	–	Good	Good
Flammability	Not combustible ordinarily	–	–	–	Partly combustible	Partly combustible

* SOURCE: The values in this chart were obtained from various sources and are believed to represent acceptable commercial standards. Special grades of some of these materials may be obtained whose properties differ from the values shown. A wide range of tempers and surface finishes is available. There are many specialized combinations of foil with other materials. Manufacturers should be consulted for additional information or for new uses for their materials. For manufacturers' names, see the Buyers' Directory at back of this book, especially the heading "Foil-Coated, Laminated, etc."

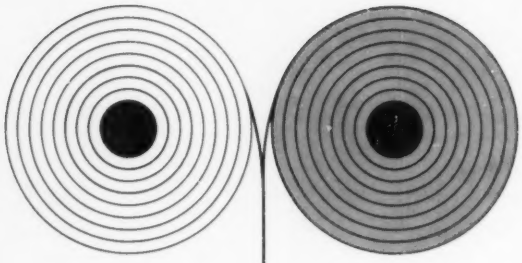
1 For more specific figures see table on page 141.

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The crisp, fresh protection of foil-laminated packaging, the attention-demanding beauty of graphics on foil and the high impulse impact of laminated foil overwraps can help give your product these selling advantages at all distribution levels.

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HOUSTON 2, TEXAS.....1310 Texas Eastern Bldg.
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LAFAYETTE, IND.....P.O. Box 500
LIMA, OHIO.....901 National Bank Bldg.
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LOS ANGELES 17, CALIF.....1145 Wilshire Blvd.
LOUISVILLE 2, KY.....1152 Starks Bldg.
LUBBOCK, TEXAS.....203 Field Bldg.
MEMPHIS 17, TENN.....4515 Poplar Ave.
MIAMI (HIALEAH), FLA.....490 Hialeah Drive Bldg.
MILWAUKEE 3, WIS.....2040 West Wisconsin Ave.
MINNEAPOLIS 24, MINN.....4010 West 65th St.
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NEWARK 2, N.J.....744 Broad St.
NEW ORLEANS 12, LA.....1225 Whitney Bldg.
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Look inside ▶

■ Higher yield, lower sealing temperatures and greater durability are just a few of the recent major developments in Du Pont cellophane. More are coming in 1962. ■ Each Du Pont cellophane is a unique film, designed to do a specific job. You'll find the right one for your package from more than 100 different cellophanes available from Du Pont. Here are a few:

cellophane

CODE	CHARACTERISTICS	PRINCIPAL USES	APPROX. YIELD SQ. IN./LB.	APPROX. THICKNESS
"K" 210-201	Superior appearance, moistureproof, heat-sealing. Good dimensional stability.	Sweet doughs, rolls, cake, bread and other baked foods.	21,000	.0009"
"K" 250-201	Particularly suited to overwrapping bread. Good heat sealability and machinability.	Bread.	25,000	.0008"
"K" 195-202	Same as "K" cellophane 201, but having greater rigidity and excellent durability.	Bags and overwraps for premium protection and appearance.	19,500	.0010"
"K" 140-202	Same as "K" 195-202.	Same as "K" 195-202.	14,000	.0014"
"K" 116-202	Heavy-duty "K" 202	Heavy or hard items, such as candy, macaroni or rice.	11,600	.0017"
"K" 180-203	Same as "K" cellophane 202, plus non-fogging.	Bags and overwraps. Also for frozen foods, including baked foods.	18,000	.0011"
"K" 195-203	Same as "K" 180-203.	Same as "K" 180-203.	19,500	.0010"
"K" 140-203	Same as "K" 180-203.	Same as "K" 180-203.	14,000	.0014"
"K" 103-203	Combines extremely good durability with top-notch appearance in addition to the other advantages of "K" cellophane.	Heavy or hard items, such as candy, macaroni or rice.	10,300	.0019"
"K" 210-FC	"K" cellophane in non-migratory colors. Available in Amber, Tango, Red, Blue, Green.	For direct contact packaging on all types of food.	21,000	.0009"
220 MD-31, 32	Moistureproof, non-heat-sealing.	MD-31 for cigarettes. MD-32 for cigars.	22,000	.0009"
210 MD-35, 36	Moistureproof, non-heat-sealing.	MD-35 for twist wraps, carton liners for frozen foods. MD-36 for caramel wrap.	21,000	.0009"
210 MSD-51	Moistureproof, heat-sealing. Good flexibility and durability.	Bread and other bakery products.	21,000	.0009"
195 MSD-52, 53, 54	Moistureproof, heat-sealing.	MSD-52 for carton wraps and direct wraps on baked foods. MDS-53 for bags. MSD-54 for products containing fats and oils, paper products.	19,500	.0010"
140 MSD-53, 54	Moistureproof, heat-sealing.	MSD-53 for bags. MSD-54 for laminations, carton overwraps and bags when better appearance is required.	14,000	.0014"
187 MSD-56, 57	Extra moisture protection.	MSD-56 for overwraps and laminations. MSD-57 for bags.	18,700	.0011"
136 MSD-56, 57	Same as 187 MSD-56, 57.	Same as 187 MSD-56, 57.	13,600	.0014"
220 MSD-60	Moistureproof, with improved heat-sealing. Provides strong seals at lower temperatures.	Bread and other bakery products.	22,000	.0009"
210 MAD-2	Moistureproof, non-heat-sealing, water-resistant.	Frozen-food carton liners and laminations.	21,000	.0009"
195 MSAD-86, 87	Moistureproof, heat-sealing, water-resistant.	MSAD-86 for moist produce items such as salad mixes. MSAD-87 for frozen foods.	19,500	.0010"
182 MSAD-90	Moistureproof, heat-sealing, water-resistant. Polyethylene-coated on one side. Recommended for increased durability and smooth appearance on larger cuts.	Fresh meat.	18,250	.0011"
195 LSD	Controlled moisture loss. Heat-sealing.	For certain produce items such as tomatoes, lemons. For sugared doughnuts.	19,500	.0010"
195 LSAD	Controlled moisture loss. Water-resistant, for use on wet or moist products.	Processed meats. Fresh fruits and vegetables.	19,500	.0010"
215 PD	Air-, dust-, grease- and oil-proof. Readily absorbs water.	General wrapping where moisture protection is not needed.	21,500	.0009"
195 PSD	Same as above, but with heat-sealing property.	Hard-crusted breads and rolls; pies.	19,500	.0010"

Cellophane designations:

A-Anchored (water-resistant) C-Colored D-Manufactured by Du Pont F-Fixed (non-migratory color) "K"-Polymer-coated L-Less moistureproof than M films M-Moistureproof P-Plain (non-moistureproof) S-Heat-sealing

■ Extra-tough "Mylar"* polyester film has high tensile, tear and impact strength, is inert to water, is moisture/vapor-resistant and is unaffected by and does not transmit oils, greases and volatile aromatics. ■ It retains these properties from -80° F. to over 300° F. Available in rolls and sheets.

mylar®

PRICE REDUCTIONS have made "Mylar" competitive with other packaging films when used by itself and as a substrate for coating and laminating applications.

TYPE	GAUGE	APPROX. THICKNESS IN INCHES	APPROX. YIELD SQ. IN. /LB.	CHARACTERISTICS	PRINCIPAL USES
C	25	.00025	80,000	TYPE C. A transparent polyester film with high tensile and impact strength. Uncoated, not heat-sealable.	General-purpose packaging and wrapping. Excellent for window boxes. Also, special labels, decorative laminations, base for metalizing.
C	35	.00035	57,150		
C	50	.00050	40,000		
C	75	.00075	26,650		
C	100	.00100	20,000		
M-22	50	.00075	27,300	TYPE M. "Mylar" with a polymer-coating to make it heat-sealable. Outstanding moisture- and gas-proofness and durability.	M-22. Especially designed for bag making where high durability and protection are needed.
M-23	50	.00075	27,300		M-23. For bundling and overwrapping products needing a durable package in storage, in transit and on display.
M-24	50	.00060	32,400		M-24. For laminating or coating with other materials for vacuum or inert-gas packaging.
M-25	50	.00060	32,400		M-25. For same use as M-24, but especially suited for use on automatic gas and vacuum-packaging equipment—superior forming base sheet characteristics.
M-26	50	.00090	21,700		M-26 for make-and-fill bag uses where extra heat-seal strength is required.
HS	50	.00050	40,000	TYPE HS. Transparent durable polyester film with essentially uniform shrinkage in each direction when heated. After shrinkage it retains all regular characteristics of "Mylar".	Makes a transparent, durable, skin-tight package for smoked meats, poultry and other products.

*"Mylar" is Du Pont's registered trademark for its polyester film.

■ Clarity and toughness are the unique combination of properties you get in Du Pont 2-in-1 polyethylene bag film. ■ The new overwrap films also give outstanding clarity and machinability. ■ These films are glossy, moistureproof, print well, heat-seal easily and have controlled slip.

polyethylene

Du Pont Overwrap Polyethylene Films are specifically designed for use as a general overwrap. They give excellent clarity, good machine performance. Available in two types: C-103 (treated one side only) and C-303 (untreated). In each series "03" film is the standard low-slip film for best machine performance.
Principal uses: overwrapping bread, textiles, paper goods, etc.

Du Pont 2-in-1 Polyethylene Bag Films combine high clarity and toughness in one film, are designed for use in bag packaging (prefabricated and make-and-fill). Available for converting in four types: A-101, A-102 (treated one side); A-301, A-302 (untreated). In each series "01" is the standard high-slip film for good machine performance, recommended for most applications. "02" films have medium slip.

Principal uses: bags for produce, textiles, baked goods, candy, macaroni, toys, tools, hardware, sports equipment, etc.

GAUGE	APPROX. THICKNESS IN INCHES	APPROX. YIELD SQ. IN./LB.
100	.00100	29,600
125	.00125	23,700
100	.00100	30,000
125	.00125	24,000
150	.00150	20,000
175	.00175	17,000
200	.00200	15,000
250	.00250	12,000
300	.00300	10,000

Ask your Du Pont Representative which is the right film for you . . .

Your Du Pont Representative is a qualified packaging specialist who has many years of experience with a broad range of packaging films. He is backed up by a research and development staff which is equally experienced. For information on packaging problems or a Du Pont packaging film, call him at one of these offices:



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BETTER THINGS FOR BETTER LIVING ... *THROUGH CHEMISTRY*

How to select and use laminations

by Ralph Becker*

At the disposal of the packaging engineer today are myriad materials, and he need only combine these materials with the proper adhesives and in the proper sandwich position to do the job required. In the market place today, the success or failure of a package is often the direct result of the selection of the packaging material to be used.

A laminated packaging material is defined as a combination of two or more webs by the use of an adhesive layer between the webs, and a coating has been defined as a substance deposited, while in a fluid state, on a web without adhesive between the combined materials.

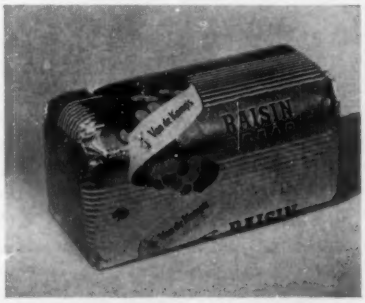
All laminations are generally broken down into four categories, namely: wax, wet, dry and extruded. We also can have combinations of these; for instance, a wax lamination combined with a dry lamination.

Wax lamination is also referred to as hot-melt bonding, for the bonding is accomplished by melting the adhesive in a heated reservoir and applying it to the web. After the web is combined with another material it is run over a chill roll to effect a set. The particular advantage in this type of laminating is the fact that there is no solvent and no solvent recovery or removal. Likewise, the speed of laminating is very high which makes this a most economical method.

There are many methods of wax bonding but the most familiar are the doctored, knurled roll application, a reverse kiss application, a Mayer bar application and a dip squeeze roll metering device. Wax, in itself, has very good water-vapor barrier properties. Thus, if we combine two sheets of cellophane with wax, we not only increase the water-vapor barrier but also increase the durability of the two materials, effecting a very good end product for the packaging of hydroscopic candies, for instance. Probably the greatest tonnage of wax-laminated material is in the wax-laminated glassine area, where this material has been used for many, many years as the ideal liner material for cereals, cake mixes and cookie products.

Inasmuch as wax, in itself, is a thermoplastic material, it can be made to perform several functions. For example, wax has multiple functions in a commonly used sheet that is foil laminated to paper, in turn wax laminated to a strike-through tissue for the overwrapping of cartons. This affords a very good barrier material and also a heat-sealing medium. When heat is applied to the foil surface, the wax flow-out through the strike-through tissue bonds in the overlap areas and also in the fold areas, effecting complete seals. Also, the wax flow fills any inadequacies of fold or intimate contact of overwrap material to carton.

Wet bonding employs liquid-type bonding agents. Silicates, starches, resin emulsions, latexes, or aqueous



FOIL-WAX-TISSUE heat-sealable overwrap for raisin bread extends shelf life, provides quality look. Reclosable feature insures freshness. (*Reynolds Metals photo*)



ATTRACTIVE, protective pouch permits new distribution approach via potato chip manufacturers. Acetate which is reverse printed in seven colors is mounted on foil laminated to polyethylene-coated super-calendered pouch paper. (*Milprint photo*)



FOIL-GLASSINE bag for chocolate bar offers upgraded shelf appeal and reduced packaging costs. Heat-sealed, grease-resistant bag eliminates preliminary foil wrapping, provides excellent product protection. (*Milprint bag*)

*Director, Order Control, Milprint, Inc., Milwaukee, Wis.



PROTECTION is prime duty of paper-wax-foil-polyethylene overwrap on dry milk carton. Polyethylene coating on inside of overwrap adds protection and gives wrapper excellent sealability. (*Marathon photo*)



LAMINATION of cellophane-polyethylene-cellophane offers superior product protection. Marring of transparency and sparkle caused by salt from nuts clinging to material is eliminated. (*Dobeckmun photo*)



COMBINATION of cellophane-polyethylene and foil provides protection required by the product. Shining gold foil with black printing presents expensive and glamorous appearance. (*Continental Can pouch*)

glues are used. Resin emulsions and latex types of adhesives provide a tough and flexible bond plus water resistance and fast drying. If high-strength bond and water resistance are not factors, silicates and starches may be used. In wet bonding, one of the combined materials must allow the passage of a solvent at a rapid rate inasmuch as the webs are combined wet and the solvent or water must escape.

The most common example of wet bonding is the ordinary paper-backed foil used in the cigarette package. This is a combination of lightweight foil laminated to paper with sodium silicate. Another familiar example is foil label stock. It is usually combined with casein latex. Foil tightwraps for dried fruits are wet bonded. Foil bags are generally wet bonded because they require (1) the very best of printing surfaces, (2) heat resistance for fast-dry printing, and (3) flexibility to afford good bag-forming properties. Oftentimes registered hot melt or thermospot patterns are provided on foil-paper combinations to be used as a carton overwrap. In this instance the adhesive used in combining the foil and paper must be heat resistant to avoid delamination when the thermospot is activated—so a wet bonding, non-heat reactive agent is used.

Dry bonding. This method uses resin lacquers, cyclized rubbers and solvent cements as the laminating agent. The most common methods of application are the direct gravure adhesive application, or the reverse kiss adhesive application. The webs are combined by pressure, or by pressure and heat at the nip of the combining rolls after the adhesive is dry or solvent free. This method of laminating is particularly important in combining materials to coarse or rough surfaces because the adhesive is applied and set before combining; in that way, great latitude is afforded in the amount of adhesive that can be used to cover up any irregularities of the stock used on the job. Increasing

(*Continued on page 155*)

Laminating agents

Type	*Example*	*General properties*	*Remarks*
Aqueous solution	Dextrins, animal glue, and the like.	Greaseproofness. Great strength and stiffness.	Low cost. Water removed after combining. Usually for papers, water-wettable materials.
Emulsion	Rubber (latex), resinous mixtures, etc.	Flexible. Limited water-vapor resistance. Can be used on porous surfaces.	Water removed before or after combining. Usually for papers or water-wettable materials.
Solvent solution	Resins or gums, synthetic and natural rubber—solvent solution.	Wide range of water-vapor resistance, waterproofness, greaseproofness; flexibility and strength; and high heat resistance.	Solvent removed before or after combining. High unit cost. May be used with any material, depending on choice of formulation and application techniques. Generally for laminations of plastic films, cellophane, etc.
Heat liquefied	Waxy, asphaltic or resinous mixtures.	Wide range of water-vapor resistance, waterproofness, greaseproofness; plus flexibility.	Low to high unit cost. May be used with any materials. Wide range of application temperatures, from about 140 to 400 deg. F., depending on composition.
	Fused resin.	Dependent upon resin used. Can be waterproof, flexible, moistureproof, greaseproof, gastight, etc.	Moderate to high unit cost. Only certain resins are capable of this type of use and special equipment is required.

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CAPRAN films are *tough* films. They offer an unusual combination of properties which suggest many uses in packaging, including skin packaging; as sheets for vacuum bag molding; as tapes or ribbons . . . and when dyed or metallized, for ornamental or decorative purposes.

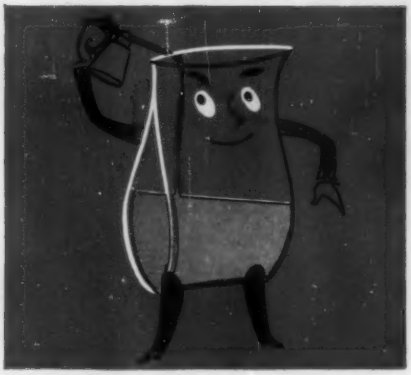


CAPRAN*

Here's what you get in CAPRAN . . .



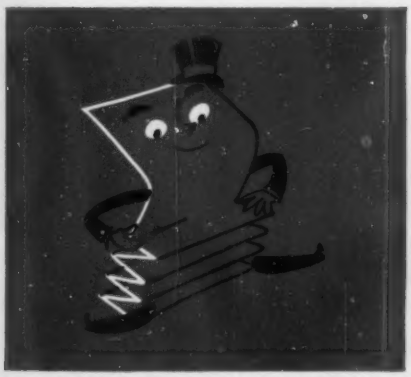
1. CAPRAN films have **excellent** tensile strength! Unoriented strength approaches 10,000 psi. High burst and impact strength!



2. CAPRAN films are unaffected by and will hold fats and oils of animal, vegetable and mineral origin.



3. CAPRAN films form an outstanding odor barrier—especially to aromatics!



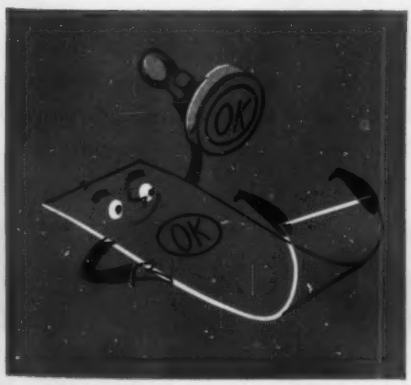
4. CAPRAN films have excellent fold endurance...superior resistance to surface wear!



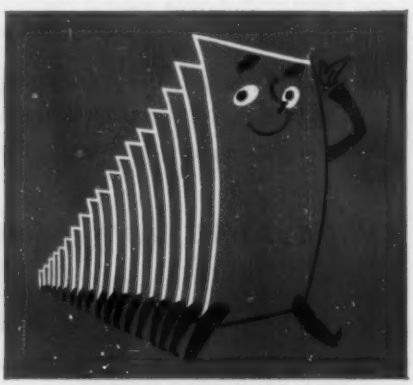
5. CAPRAN films offer transparency range from hazy to clear.



6. CAPRAN films are serviceable at temperatures from —100°F to 200°F. Not deteriorated by autoclave sterilization.



7. CAPRAN films are printable! No special treatment needed!



8. CAPRAN films give HIGH YIELD! Sealable by electronic or thermal methods.

For additional information and technical data on CAPRAN films, write or phone Film Department, General Chemical Division, Allied Chemical Corporation, 40 Rector Street, New York 6, N.Y.

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40 Rector Street, New York 6, N.Y.

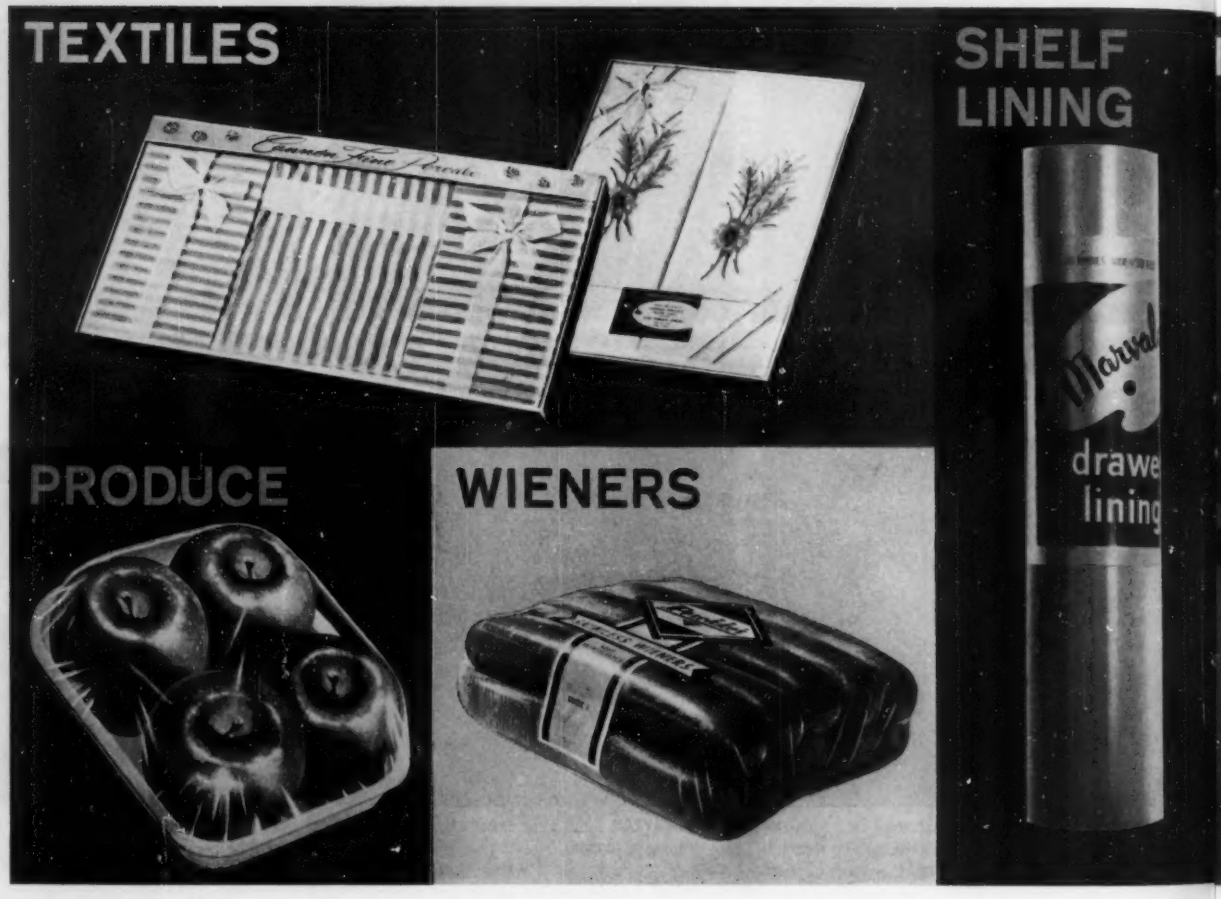
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GOODYEAR

TWO FILMS... O

Lasting Beauty

VITAFILM



Provides superb machinability, strength, transparency. Transmits texture of contents right through package, speeds shopping and sales.

Costwise, these expertly designed Goodyear films are right in line with the lowest-priced of conventional packaging films. Yet, they give you all the advantages mentioned above, print beautifully, adapt readily to all types of automatic packaging machinery.

Lots of good things come from **GOOD**

S... ONE PURPOSE:

ty and Protection

PLIOFILM



Insures freshness, clarity, machinability. Heat-seals with an airtight weld that's as strong as the film itself. Stretches to fit any shape with skintight neatness.

If you're seeking additional packaging glamour and protection for your product, consult the Goodyear Packaging Engineer. He'll recommend the film best suited to your needs. Write: Goodyear, Packaging Films Dept. W-6424, Akron 16, Ohio.

D YEAR

Vitafilm, a Polyvinyl chloride; Pliofilm, a rubber hydrochloride—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

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Extra Strength and Fine Printability for FOIL, FILM and POLY COMBINATIONS

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HEAT SEAL WAXED GLASSINES

Moistureproof, Greaseproof Protection PRESERVES FLAVOR, AROMA, FRESHNESS

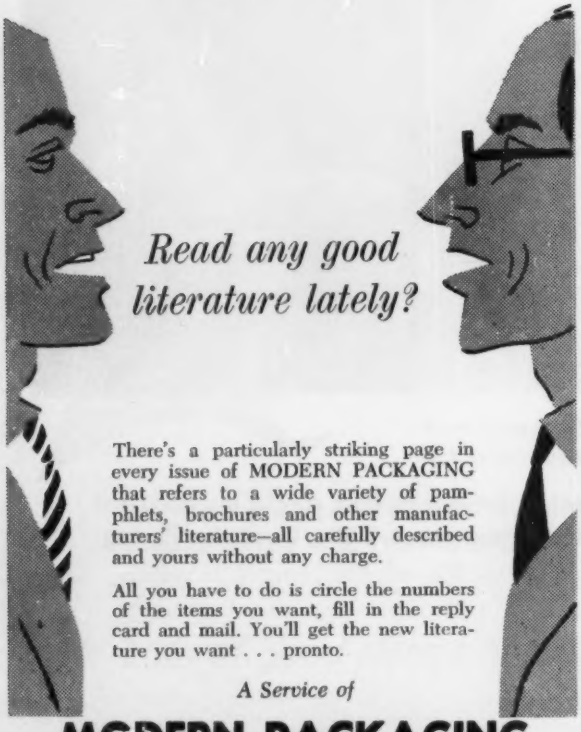
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Standard Packaging lists

56

reasons for dealing with an integrated packaging source

Perhaps you use only a few kinds of packaging materials. Perhaps *quite* a few. In any event, it's a good idea to deal with a source that can give you a wide enough choice—impartially—to meet the marketing needs of *all* your products The right materials for you are probably listed below. May we make our recommendations?

1 Bags, film
2 Bands, paper
3 Bottle caps
4 Bottle hoods
5 Boxboard
6 Boxboard, foil lined
7 Boxes, folding
8 Boxes, setup
9 Boxwraps, paper
10 Cans, paperboard
11 Cap liners
12 Caps, disc
13 Caps, pull
14 Closures, film
15 Closures, foil
16 Closures, paper
17 Closures, laminated
18 Displays, counter
19 Displays, lithographed
20 Display-shippers
21 Drum liners
22 Envelopes, film
23 Envelopes, paper
24 Film packaging
25 Foil
26 Foil laminations
27 Hood closures
28 Inserts
29 Labels, paper
30 Labels, foil
31 Laminations, film
32 Laminations, film/foil
33 Laminations, paper/film/foil
34 Lids, foil
35 Lids, paper
36 Lids, laminated
37 Moisture-barrier materials
38 Overwraps, film
39 Overwraps, foil
40 Pails, paper
41 Papers, printing
42 Paperboard
43 Pouches, film
44 Pouches, foil
45 Pouches, laminated
46 Roll stock, film
47 Roll stock, foil
48 Roll stock, paper
49 Sheets, film
50 Sleeves, paper
51 Sleeves, paperboard
52 Trays, paperboard
53 Tubes, paperboard
54 Tubs, paperboard
55 Vacuum packaging machinery
56 Vacuum packaging materials

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(*Continued from page 150*)

the amount of adhesive provides a "padding" or cushion effect and thus allows for subsequent deep embossing.

The most common use of dry bonding is in the oleomargarine or butter foil-innerwrap category. A vinyl lacquer used for the foil must be protected from the product to avoid corrosive action.

There are other important examples. Dry bonding cellophane to cellophane provides a much more durable product with very high clarity. Approximately 50% of all vacuum pouches today are laminated. Combinations include polyethylene to cellophane and Mylar to polyethylene. The Mylar or the cellophane may be saran coated. Cellophane dry bonded to Pliofilm makes a very good nut package, allowing the use of nitrogen gas packing. Acetate/foil/Pliofilm and acetate/foil/heat-seal coating are additional examples of dry bonding.

Extrusion lamination. This method of laminating is almost totally confined to use with polyethylene. The advent of polyethylene opened many new vistas to the laminator, particularly in the area of heavy-duty barrier laminations. These vistas have been further extended by the work being done by resin manufacturers, allowing the reduction in the thickness of polyethylene being used as a laminant by varying the density and oftentimes ending up with superior results. Many successful pouches contain polyethylene as the laminating agent; it imparts the necessary strength required for handling plus flexibility, low cost, toughness and good water-vapor barrier properties.

Often one, two or three different methods of laminating will be used in obtaining a final combination. For instance, one of the popular carton overwrap materials combines foil wet bonded to paper, and this combination is then waxed to a strike-through tissue. The result is a material that has a very good scuff resistance as far as the adhesion of the foil to the paper is concerned—plus the strike-through heat-seal features of the waxed material. Another good example is the highly efficient dry yeast package wherein the initial foil-paper lamination is wet bonded; dry bonding is then used for the combination of foil to the initial foil-paper lamination and for adding a layer of Pliofilm to the inside foil membrane.

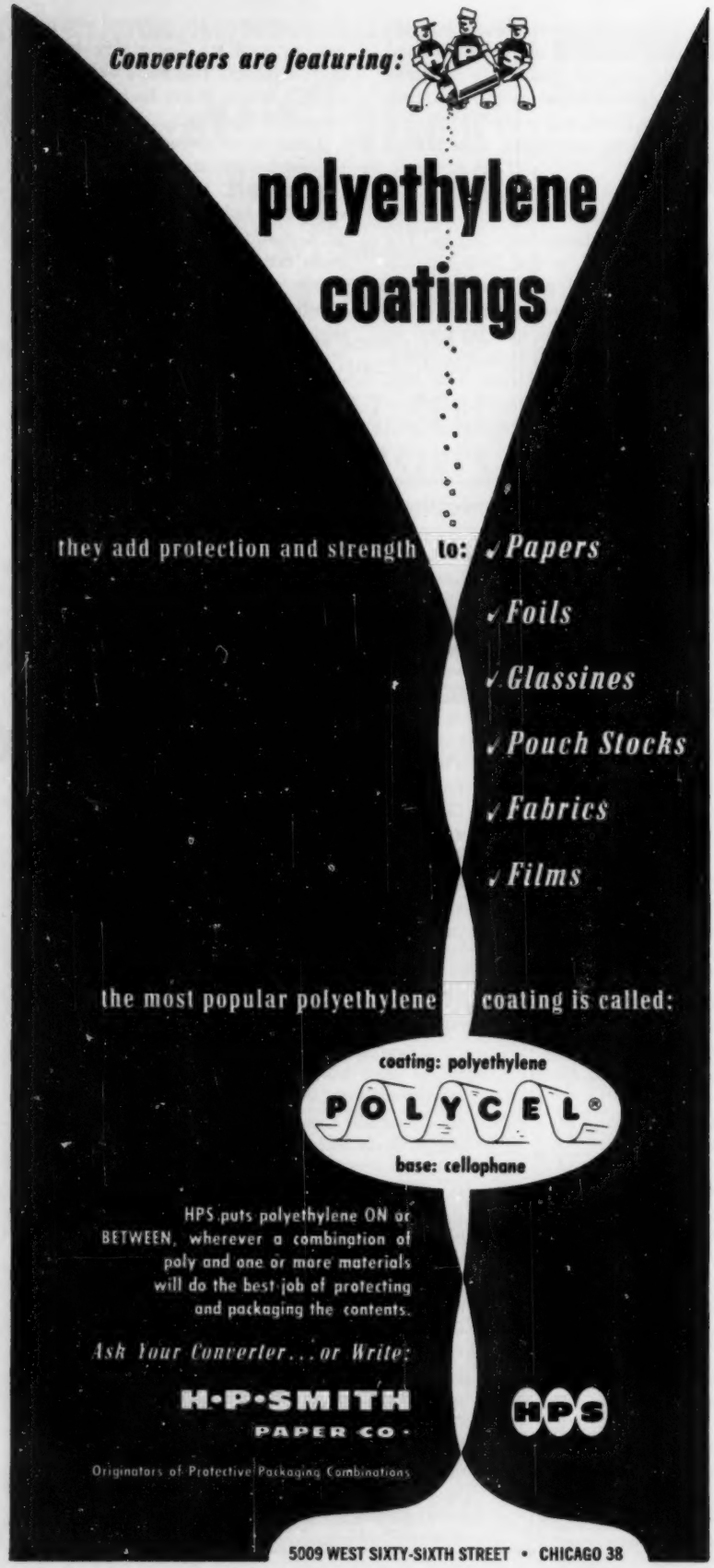
The extrusion lamination process, in its most basic form, often eliminates the combination of a second web and concentrates on coating a material such as polyethylene on the web, thus adding a functional component to the original basic membrane. (See also p. 573.)

When one views the newer laminations on the market, it is evident great strides have been taken. For example, there is the boil-in-pouch bag consisting of polyester film laminated to medium-density polyethylene. These pouches can be used to boil items like stews, spaghetti sauce, shrimp creole and chicken a la king for upwards of one hour. Good physical strength, grease resistance and flavor retention are required and present, as well as the ability to take thermal shock. This same bag is interesting because it can be used in high-frequency cooking.

Today much attention is being given to stretch laminations. Certain special thermoplastic films are heated, stretched and applied, more or less as a coating, to a substrate, and in some instances the stretched thermoplastic material may even become a bonding agent between two other materials. The result: excellent bridging or coating continuity, with thin coating possible, making the lamination economical and eliminating problems such as solvent recovery.

Typical laminations and their applications

Materials	*Characteristics*	*Typical uses*
Foil-wax-sulphite	Excellent WVTR. Dead fold. Pliable. Good machinability	Candy wrap
Cellophane-wax-cellophane	Excellent WVTR. Trapped printing. Pliable. Machines well	Bag or pouch for hydroscopic items
Foil-adhesive-groundwood	Inexpensive label stock. Readily glued, easily removed in bottle washers, minimum curl, smooth printing surface. Easily embossed	Bottle, can, canister labels. Box covers
Lacquer-coated foil-adhesive-wet strength sulphite	Corrosion resistance. Wet strength. Easily embossed. Machines well	Butter and margarine, intimate wraps
Cellophane-adhesive-Pliofilm	Excellent gas barrier. Trapped printing	Nut packaging with inert gas
Acetate-adhesive-foil vinyl coated	Good rigidity. Excellent gas, WV barrier	Pharmaceuticals, drink powders; dehydrated coffee
Polyester film, saran coated-polyethylene	High strength. Positive sealing. Excellent gas, WV barrier	Vacuum food pouches
Glassine-polyethylene-foil-polyethylene coated	Good rigidity. Good gas,water barrier. High tear, puncture resistance. Grease resistance	Pouch stock for dehydrated foods, pipe tobacco
Foil-adhesive-sulphite-wax-tissue	Scuff resistant. Good machinability. Easily heat sealed. Excellent gas-water barrier	Carton overwrap
Cellophane-adhesive-foil-wax	Excellent gas-moisture barrier. Easily heat sealed, pliable. Can be pressure sealed	Processed cheese wraps. Carton overwraps, crown liner, bottle, jar sealer, label
Cellophane-adhesive-cellophane	Excellent WV barrier. High clarity, greater durability. Good machinability. Locked-in printing	Carton overwrap, bags, direct wrap. Frozen-food application
Foil-adhesive-paper-polyethylene	Excellent WV barrier. Fin-type or back-seal pouches. Good machinability	Soup mixes, drink powders, dry milk solids
Cellophane-polyethylene-foil-adhesive-polyethylene	Excellent gas-moisture barrier. Locked-in printing. Often used as face of pouch combined with cellophane-polyethylene backs	Luncheon meats, soup mixes, hydroscopic products



Checklist of product packaging characteristics

The following categories are points packagers should consider when planning a new unit. (See also "Planning Your Package," p. 26.)

Foods, dry flowable

A. Equilibrium humidity
B. Freeness of fats
C. Index of failure: moisture, oxygen, temperature, volatile components (flavors, CO_2, etc.)
D. Static (useful for filling and closing equipment)
E. Flowability (useful for filling and closing equipment)
F. Abrasiveness
G. Chemical activity (interaction with the package)
H. Bulk density

Foods, damp or nonflowable

A. Freeness of water
B. Freeness of fats
C. Equilibrium humidity
D. Index of failure: moisture, oxygen, temperature, volatile components
E. Plasticity
F. Chemical activity
G. Bulk density

Foods, frozen

A. Index of failure: moisture, oxygen, temperature

Foods, fresh produce

A. Humidity requirements
B. Index of failure: moisture, oxygen and other gases, temperature

Chemicals, dry flowable

A. Equilibrium humidity
B. Index of failure: moisture, oxygen and other gases, temperature, volatiles
C. Flowability
D. Static
E. Abrasiveness
F. Chemical activity
G. Bulk density

Metal and electrical products, etc.

A. Durability and oiliness of anticorrosive coatings
B. "Dryness" of surface finishes (resistance to adhesion between the package and product finishes)
C. Index of failure: moisture, oxygen, *p*H and specific agents
D. Abrasiveness (of metal surface of finishes)
E. Humidity and temperature as related to corrosion
F. Chemical activity (electrolytic effects)

Clean as a whistle- and ready for work



...thanks to Kodapak "STOP-LOSS" packaging!

Stop-Loss packaging? What's that? What does it mean?

Actually, "Stop-Loss" describes special packaging in a very special, tough, crystal-clear material . . . Kodapak II Sheet.

In this instance, Holland Industries, Inc., (Buffalo, N.Y.) picked Kodapak II to package Champion's Spark Plug Gauge and Tool in groups of ten blisters each to a self-seller display card.

Result: Skin-tight protection from dust, dirt and moisture . . . plus complete visibility! This keeps merchandise fresh and clean, assures fast *unit-sell*, stops loss from both shop-wear and pilfering. At the same time, protecting blister is easily removed by purchaser. For more about Kodapak II and packaging, see our representative or write:

EASTMAN KODAK COMPANY
Plastic Sheeting Division, Rochester 4, N.Y.

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Kodapak SHEET

"Kodapak" is a trademark for Eastman's plastic sheet.

Sterilization with gas



THROWAWAY POLYSTYRENE SYRINGE, heat-sealed in moistureproof cellophane, is sterilized by gas permeating pouches after they have been packed in shipping cartons.

Renewed interest in the 20-year-old process of gas sterilization is stirring among packagers who must sterilize many products that are heat sensitive packaged in plastic. As a substitute for steam sterilization in autoclaves, gas sterilization makes it possible to utilize gas-permeable films and products made of materials that would distort under the conventional autoclave procedure of high-heat sterilization.

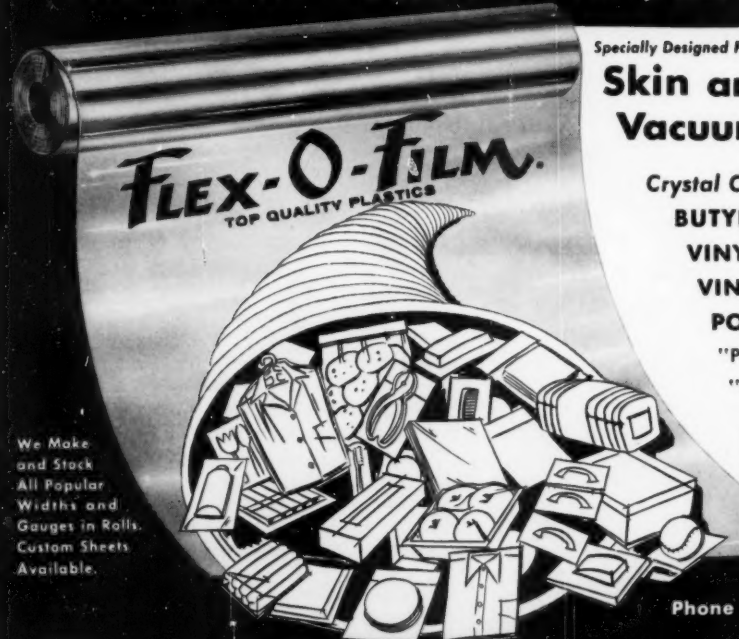
Ethylene oxide, for example, is used to sterilize disposable plastic intravenous injection sets after they have been packaged in lock-tab paperboard trays inserted in full-seal-end folding cartons and packed in lots in corrugated shipping boxes.

Both the plastic parts and the two-piece package absorb some of the gas and show continuing sterility after removal from the gas chamber. The low-cost plastics now used—vinyl, acrylic, polyethylene and nylon—would not withstand the heat of a steam autoclave formerly used for sterilization of the sets when they were made of materials of greater heat resistance.

Gas sterilization reportedly gives excellent sterility control. Its quarantine area can be located near the shipping dock; materials handling is reduced to a minimum and the packaging operation falls into logical sequence in the manufacturing set-up. Previously, packaging could be done only after the sets had been steam sterilized and dried.

The process suggests itself for a wide variety of products that require sterilization or fumigation.

PACKAGING BEGINS WITH FLEX-O-FILM



Specially Designed For:
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VINYL—Rigid Gauges .002 to .030
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Dobeckmun helps solve a dual problem for Duncan Hines with twin packages:
(A) METALAM®
to give perishable egg whites the extra protection they need.
(B) Laminated, treated paper to keep the cake mix fresh.

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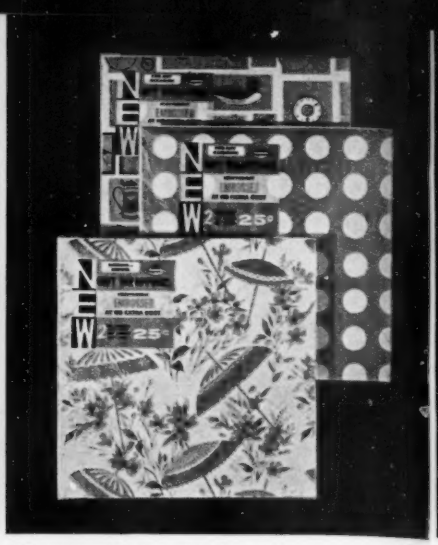
Solve problems and sell products with custom packages by Dobeckmun. Draw on the broadest range of materials and techniques, the biggest fund of experience, the boldest new concepts in flexible packaging. We take the trouble to pioneer because our experience proves it pays to be first. And you are first...first with product protection, consumer convenience and brilliant display that makes your name stand out. Unique, because your package is tailor-made. Put Dobeckmun packaging skills to work for you. Write or call THE DOBECKMUN COMPANY, a Division of The Dow Chemical Company, Cleveland 1, Ohio • Berkeley 10, California • Offices in most principal cities.



Spaghetti and macaroni get top protection



Leading bakers wrap bread in Olefane



Gift wrap gets its own display window

AVISUN *OLEFANE*®

...tough, crystal-clear polypropylene film

Olefane is proving the answer to industry's need for versatile, low-cost packaging film. Many of its properties equal or surpass those of polystyrene, polyethylene, cellophane, and other packaging films. Olefane is already the preferred packaging film for bakery products, paper goods—and is well suited for a broad variety of food products and industrial uses.

TYPICAL PROPERTIES

Density (gm/cc.)	.905
Yield (sq. in/lb. @ 1 mil)	31,100
Tensile Strength (p.s.i.)	
Machine Direction (M.D.)	5700
Transverse Direction (T.D.)	3200
Elongation (%)	
M.D.	425
T.D.	330
Stiffness (p.s.i.) (Initial Modulus)	
M.D.	95,700
T.D.	98,300
Tear Strength (gm/mil)	
M.D.	50
T.D.	550
Impact Strength (70°F. Spencer test)	420
Coefficient of Friction	0.4-0.7
Haze (%)	0.5-3.5
Heat Seal Range (°F) (depending upon machinery)	285-425
Water Vapor Transmission Rate (gm/100 sq.in/24 hrs/1 mil)	0.70
Maximum Use Temperature (no load) (°F)	270-280
Flex life	unlimited
FDA approval	Yes
Shrinkage in boiling water	nil

LOW COST. New price of Olefane is just 64c per lb. on orders of 500 lb. or over.

HIGH YIELD. Light weight of Olefane gives ultra-high yield—up to 35,400 sq. in. per lb. in the new .87 mil film.

LONG LIFE. Won't embrittle or deteriorate with age. Protects products longer.

MACHINABILITY. Has ideal stiffness and slip, constantly uniform thickness, runs smoothly. Fewer rewraps and waste.

HIGH SALES APPEAL. Sparkle and clarity "showcase" the product for added customer appeal. Pleasant to the touch—neither too stiff nor too limp.

BETTER PROTECTION. Rugged Olefane resists tearing and abrasion, has best moisture barrier of any commonly used bread film.

CHEMICAL RESISTANT. Shrugs off the effects of most chemicals, alkalies and acids found in food and non-food products. Products stay fresh and clean.

NEW! *OLEFANE -U*

Uniaxially oriented polypropylene film features outstanding properties for packaging.

VAPOR-MOISTURE BARRIER. Penetration of moisture, carbon dioxide and oxygen through .6 mil uniaxially oriented film is the same as that of 1 mil unoriented film.

TENSILE STRENGTH UP. Lengthwise strength doubled—that of crosswise direction multiplied eight times for same mil thickness of unoriented film!

MORE STIFFNESS. Approximately doubled—in both lengthwise and crosswise directions.

GOOD IMPACT STRENGTH. Equal to that of unoriented polypropylene film—but retains much of its impact strength at 0°F.

For more data on this exciting new film, write to us.



Lipstick cases offer low-cost glamor



Blow-molded bottles resist heat, chemicals



Caps and closures are stylish, colorful

AVISUN*

POLYPROPYLENE

Design for better detail, gloss, color— and get excellent properties at low cost

AviSun polypropylene offers the packaging engineer an unmatched opportunity to combine advanced style and beauty with functional efficiency. Well suited to injection molding (or, in impact grades, vacuum and blow molding), this new polymer is tough, light, and offers excellent heat and chemical resistance. Molded containers can include a self-hinge that actually strengthens with use! Polypropylene is so versatile it may well be the anwer to hundreds of applications where other plastics now used cannot provide the properties required—or where appearance is being sacrificed to achieve the functional end product.

Blow-molded 5-gallon laboratory bottle is tough, light, resists autoclaving temperatures



Check these points:

1. **Heat resistance**
2. **Chemical resistance**
3. **Toughness**
4. **Economy**
5. **Self-hinge**

These are but five of the many reasons why AviSun polypropylene makes better products at lower cost. For more data—or assistance by AviSun technical specialists—on *any* application —write direct to:

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Executive Offices
1345 Chestnut Street
Philadelphia 7, Pennsylvania

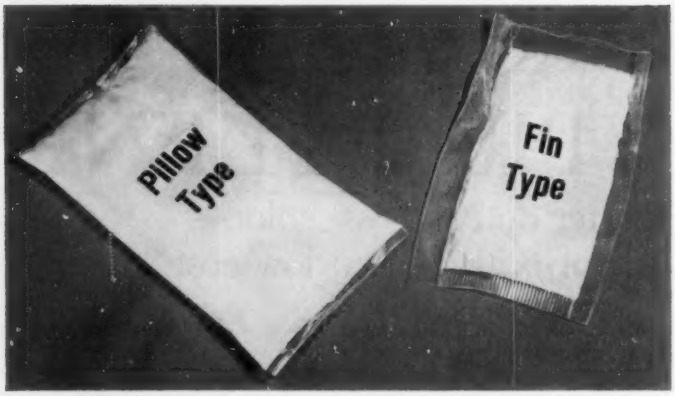
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Swift-Dissolving PVA Film for Packaging Liquids, Powders and Solids



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Now, Mono-Sol provides packagers with a highly practical, 100% water-soluble Polyvinyl Alcohol Film having remarkably improved stability over a wide humidity range. Mono-Sol PVA Film can be used on most standard package filling and heat-sealing machines on a production basis, with only slight modification. This means you can now package with a material *specially made* to serve *all* your needs and you can realize unparalleled benefits and greatly increase your sales volume, if you are a packager of any of the following, (or similar) products: **Soaps. Detergents. Bleaches. Insecticides. Sodium Bicarbonate. Medicinals. Sodium Hyposulfate. Napthalene. Dyes. Oils. Greases. Trisodium Phosphate.**

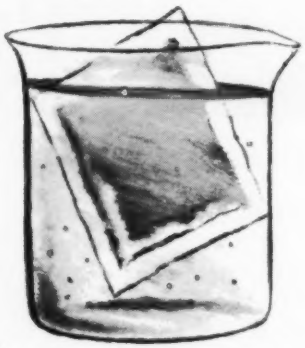
Consider these natural sales features offered by Mono-Sol's PVA Film. It is the world's easiest dispenser, requires no opening nor messy handling. No weighing or measuring, provides user with correct amount every time. Nothing to discard, user just drops package into cool or hot water and stirs. Film completely dissolves, releasing contents into the solution. Completely transparent, user sees contents clearly. Strong and stable, it will not crack in *low*, nor melt in *high* humidities. It is impermeable to oxygen, nitrogen and other gases and is resistant to oil, aromatic and petroleum solvents.

Samples and full technical data available. For evaluation or market testing, Mono-Sol will make limited runs of filled water-soluble PVA pouches *using your own product.* Please indicate the nature of your product and how many units you will need. **Write today ➤**

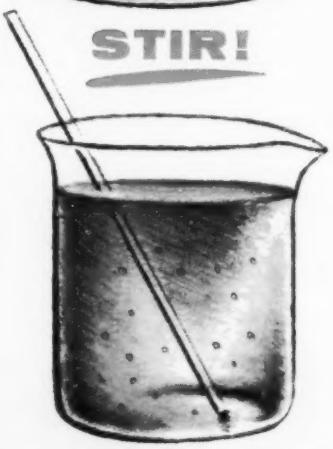




DROP!



STIR!



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...WITH MILPRINT GAS PACKAGING MATERIALS! Subtle flavors, colors, aromas, nutritional values—the very elements that give your product its unique character—are first to be attacked by the oxygen in air normally present in food packages! Gas packaging prevents this flavor fadeaway by replacing air with nitrogen, carbon dioxide or other inert gases during packing . . . so your product reaches your customer exactly as you intended it should. (And gains a new lease on shelf-life and customer satisfaction as well!) Milprint research adds laminated gas packaging materials to the thousands of custom-built combinations developed to meet specific marketing needs in more than 60 years of serving America's best-known brands. *No other source offers so wide a material variety, so many printing processes—or so much experience in creating packaging "firsts!"* Plan now to review your packaging regularly with Milprint experts . . . learn how

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50 years of experience in the transparent packaging field

LA CELLOPHANE S.A.

CREATOR OF THE CELLULOSE FILM INDUSTRY IN THE WORLD

places at your disposal :

- a complete range of plastic and cellulose films specially designed for practical and high quality printing and bagmaking.
- The experience of its technical departments specialized in all problems concerning film conversion and applications.

SLC

LA CELLOPHANE S·A

110 BOULEVARD HAUSSMANN, PARIS, FRANCE

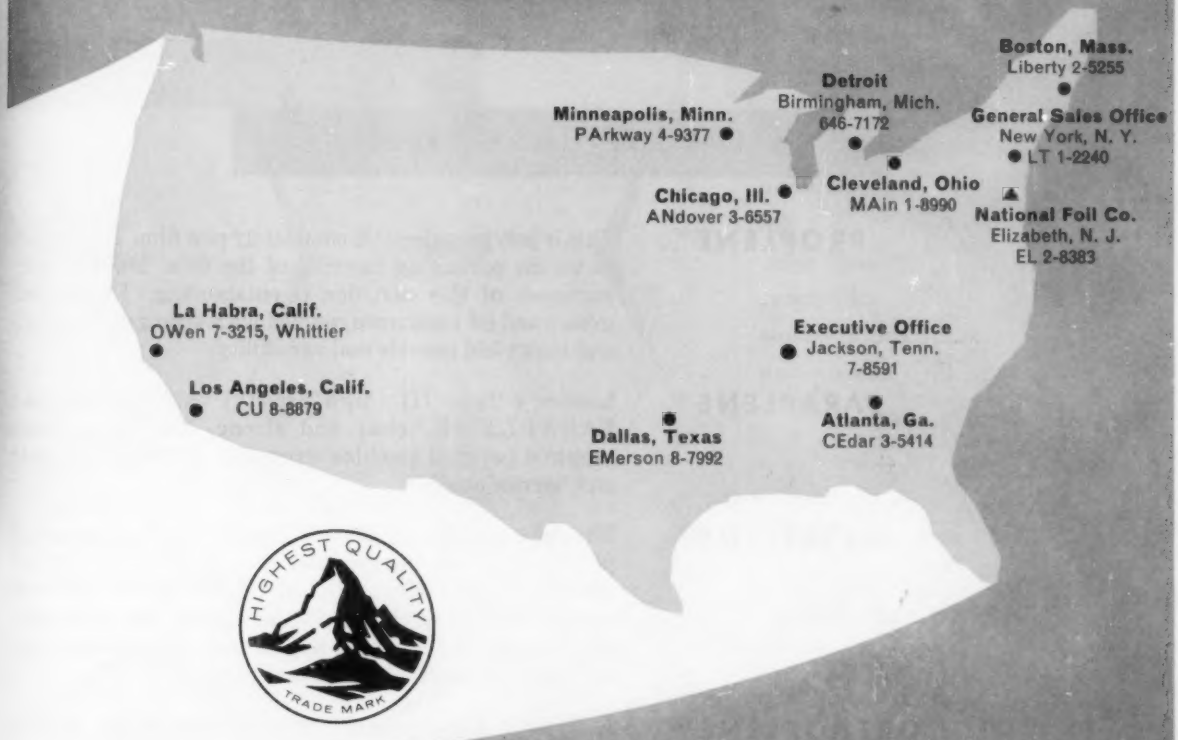
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FOR QUALITY LAMINATIONS OR FINEST PLAIN FOILS

CALL

ANY OF THESE OFFICES



HIGHEST QUALITY TRADE MARK

With the acquisition of National Foil Company, Consolidated Aluminum Corporation — a company long known for highest-quality plain foil — can now supply you with quality embossed, colored and laminated foils. For information, contact any of the offices shown above.

CONSOLIDATED ALUMINUM CORPORATION

Executive Office • Jackson, Tenn.
General Sales Office • 9 Rockefeller Plaza • New York, N. Y.

Ludlow

PROVIDES INFINITE MODERN

LUDLOW CAST FILMS

PROPLENE* This is polypropylene. A completely new film. It promises to be the packaging favorite of the 60's. Machine performance of this cast film is outstanding. Exceptional grease and oil resistance coupled with strength, economy and high yield provide real versatility.

PARAPLENE* Ludlow's Type III (high density) cast polyethylene. PARAPLENE, clear and strong, has the stiffness required for good machine wrapping. Excellent stability and barrier qualities.

METAPLENE* The showcase film. Ludlow's Type II (medium density) polyethylene has the greatest clarity and sparkle of all the polyethylene films. METAPLENE greatly improves machine overwrapping production speeds. No other polyethylene offers so much in appearance, performance and value as this most useful of cast films.

ORTHOPLENE* A Type I (low density) polyethylene which derives exceptional quality from Ludlow's cast film process.

CAPLENE* Made from nylon 6, is a clear superstrong barrier, with the broad chemical and heat resistance of nylon plastic materials. Compare it with higher priced heat-sealable polyesters for both industrial and packaging application.

★ ★ . ★

Ludlow's cast films are all heat sealable. All handle easily on packaging machinery. They have what it takes to make packages look better, last longer, sell faster.

The development of cast films by Ludlow follows years of leadership in the field of polyethylene extrusion coating. Today you can look to Ludlow, not only for cast films, but for an endless variety of film, fabric, foil and paper combinations. Let Ludlow leadership give your package the look of tomorrow.

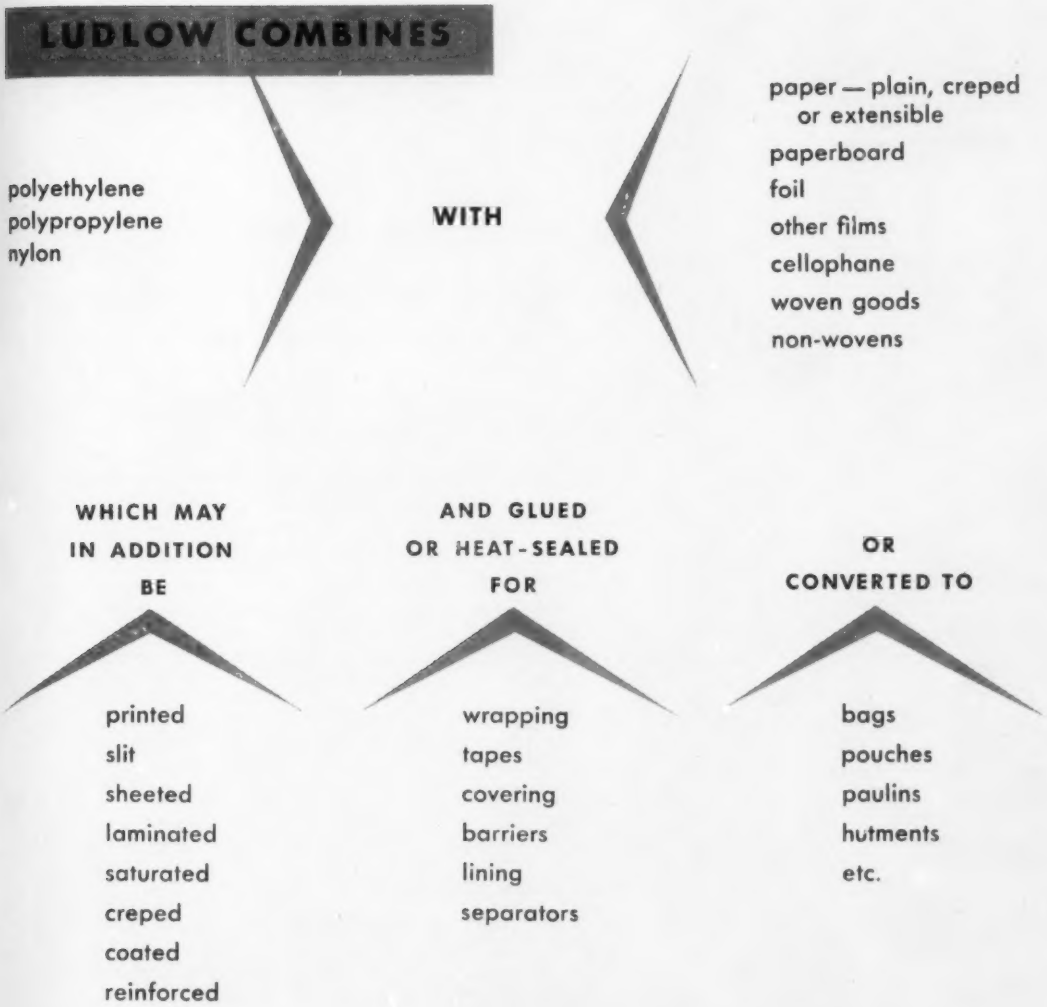
LUDLOW PLASTICS

A Division of Ludlow Corporation

Needham Heights, Mass.

**Trademark of Ludlow Corporation*

A SINGLE SOURCE FOR AN VARIETY OF THE MOST FLEXIBLE PACKAGING MATERIALS



SILICONES

Ludlow Silicone coated papers release cleanly from sticky surfaces. In the rubber field alone there are countless variations in adhesion, each of which is a handling or packaging problem. Asphalt, plastics and the food industry have sticking problems, too.

Ludlow designs silicone coatings to provide bags or liners, wrapping or interleaving, that will eliminate these problems.

Custom designed and serviced Silicones by Ludlow may be the solution to your problem. Write, Ludlow Plastics, Needham Heights 94, Massachusetts.



Anaconda Aluminum offers the packaging market a complete line of foil products

Because of superior quality foil products, unexcelled service and technical assistance to its customers, Anaconda Aluminum has grown and become recognized as a leading supplier of foil for many packaging and labeling applications.

With a wide range of products—from plain foil to fabricated rigid foil containers—Anaconda Aluminum has directly contributed to the packaging industry's phenomenal growth—by remaining ahead of the industry's needs. It will pay you to learn about the extra help you can get from Anaconda Aluminum in applying foil to any application. Here from one source comes a vast reservoir of information to help you with quality products and understanding of how you can best apply them.

LAMINATED FOIL STOCK—coated, embossed or colored—laminated to paper or board—to your exacting specifications.

LAMINATED FOIL BOXBOARD STOCK—foil laminated to paper board—your own board or any special board you need; foil laminated to paper—to your specifications for remounting in your plant.

FOIL LABEL STOCK—Anaconda Aluminum offers a variety of foils for letterpress, gravure, flexography, silk screen and lithography (see below).

LITHOGRAPHIC FOIL STOCK—specifically for lithography, Anaconda Aluminum offers ANALITH, a special precoated foil stock. Coatings are custom-planned for most efficient, lowest cost, high-quality lithography.

LABEL AND INNER-LINER FOIL STOCK—for laminated foil cans. Anaconda Aluminum not only produces stock for presently-manufactured spiral- and convolute-wound cans, but has led the field in introduction of spiral-wound foil cans with a unique seal for use with liquids.

PLAIN (UNSUPPORTED) FOIL—suitable for lamination to paper, films or other materials is available in all forms, processed to your specifications.

RIGID FOIL CONTAINERS—One of the most complete lines in the industry . . . a wide variety of sizes and shapes, for use with multi-purpose lids and covers. A full line of lidding and closure equipment is available. Anaconda Aluminum will work with you to meet all your package needs.

HELP IN DESIGNING FOR PRINTING ON FOIL—"Aluminum Foil Design", a book packed full of practical suggestions on how you can get the most from the unique printing opportunities foil creates. Write for your copy, or for literature on other Anaconda Aluminum foil products. Anaconda Aluminum Company, Dept. MPE, Louisville 1, Kentucky.

ANACONDA ALUMINUM

SALES HEROES ARE MADE BY CELLU-CRAFT EXTRUSION COATED & LAMINATED PACKAGES

PULL


JOYVA
HALVAH
at its BEST!
MARBLE
TO OPEN...TEAR from
for full flavor enjoyment
SERVE AT ROOM TEMPERATURE
KRAFT
NATURAL
SWISS
CHEESE
8 OZS.
NET WT.
Sliced
AGED OVER 60 DAYS
KEEP UNDER REFRIGERATION
ARMOUR
BUTTERED BEEF STEA
CHOPPED · CUBED · FROZ
NET WT.
16 OZS.

You're next, sir! Help yourself from Cellu-Craft's packaging platter... heaped high with all the "fixin's" to make you a sales hero. Cellu-Craft solves your roughest packaging problems with imaginative, business-wise design; production-perfect printing; smooth, accurate converting; backed by thoroughly reliable service. MORE: Cellu-Craft offers Extrusion Coated and Laminated materials with a difference... consistently uniform, perfectly bonded, crystal clear, because they're produced on the industry's most rigidly controlled equipment. Whether your packaging calls for bag, pouch, roll or sheet—Cellu-Craft's Laminated and Extrusion Coated materials give you the smoothest possible production flow with unparalleled reduction in "leakers" and waste .....

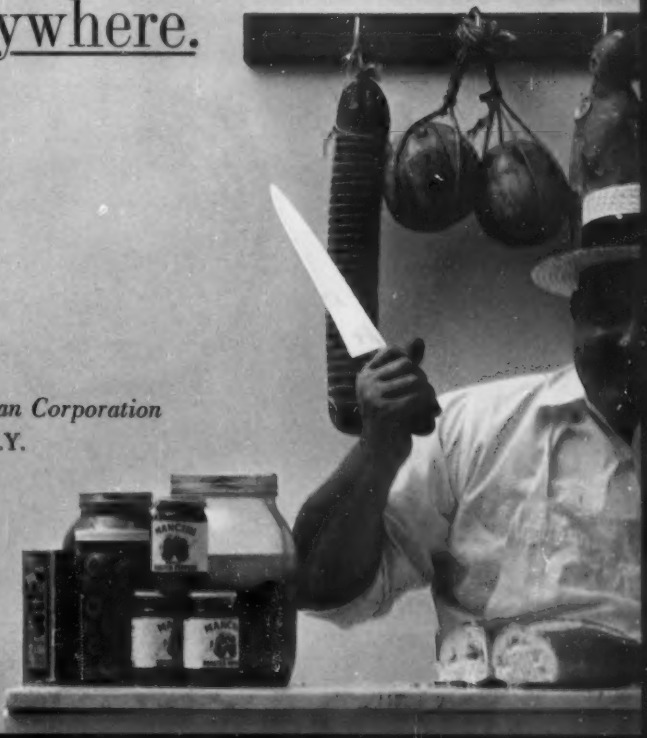
They're all here for you at Cellu-Craft... liberally sprinkled with seasoned merchandising savvy that makes your packages perform sales heroics.



Perfect Printing & Converting

Cellu-Craft prints crisply on a wide variety of standard and laminated films to give you the material and package you need for the product you pack—whether it's Food, Drugs, Hardware, Soft Goods or any other...Cellu-Craft's wide variety of converting equipment manufactures Bags, Pouches, Rolls or Sheets to your satisfaction... From Art through Platemaking, Printing and Converting, Cellu-Craft integrates every phase to provide you with a package that performs perfectly everywhere.

F
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ingre
fr
Cellu-
hero-
packa
pla
...Cho
fr
all
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sales-b
serv



CELLU-CRAFT

PRODUCTS COMPANY *A Division of Rapid-American Corporation*

General Offices & Plant, 1401 Fourth Ave., New Hyde Park, N.Y.
Telephone PRimrose 5-8000 • *Sales Offices in principal cities*
DESIGNING of flexible packages
PRINTING: Glolux® Gravure, Process, Line & Tone Flexography on Cellophane, Polyethylene, Glassine, Extrusion Coatings, Laminations, Acetate, Pliofilm, Foil.
EXTRUSION COATINGS AND LAMINATIONS on Cellophane, Foils, Mylars, Papers, Fabrics.
CONVERTING: Rolls, Sheets, Bags, Pouches, Envelopes.

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Craft's
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Award Winning Design

Cellu-Craft's brilliant Art Department analyzes your present package, researches it against competition, creates magnetic new packaging designs that insure your success on the sales floor.

Creative Merchandising

Cellu-Craft's sales packaging engineers draw on their merchandising background to suggest many ways in which you can build entire programs around new packaging materials and methods, designed to move up sales volume.



use the tough

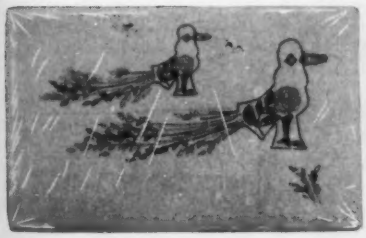
EMBOSSED

CLOPAY FILM

CLEAR

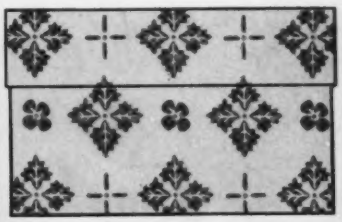
designed for your SPECIFIC packaging requirements!

Whatever your skin pack or special wrap application, there's a Clopay plastic film to fill the bill . . . and fit your budget.



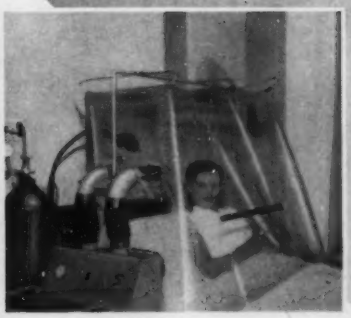
clopane

Rolls, sheets, tubes up to 60". Add sparkle and sales-appeal to any product. Clean, crystal-clear, extra-strong. Resists moisture, atmospheric changes, wrinkling. (Shown: Martex Towel Set.)



NEW EMBOSSED POLY FILM

—for handsome, low-cost gift wraps, boxes, liners, kits, etc. Priced in line with fine paper . . . but feels finer, won't tear, *looks like fabric.* Available in complete range of thicknesses, colors, patterns, widths. Takes imprinting of any kind.



PROTECTIVE SHEETING

Versatile Clopane adapts to many out-of-the-ordinary usages. For example, oxygen canopies for Chicago Equipment & Service Company.

Clopay produces a complete range of sparkling clear vinyl and polyethylene films. For complete information on clear vinyl, polyethylene or embossed polyfilm, write

Let us quote on your next job!

CLOPAY CORPORATION • CLOPAY SQUARE • CINCINNATI 14, OHIO

Six reasons why Alcoa Aluminum Foil makes a more protective package...

Moisture Protection: Foil is the best barrier against moisture vapor. Foil keeps moisture out of dry or dehydrated products and seals moisture in if that's where it belongs.

Grease Protection: Foil will not stain, discolor, or break down physically before the onslaught of oil or grease. Medicinal oils, grease-based cosmetics, surgical dressings, frozen meats and fish have offered a packaging challenge which foil has met successfully.

Contamination Protection: Products sealed in foil packages are completely protected from contaminating tastes and odors. And foil will not allow the natural flavor, aroma and freshness of your product to escape.

Purity Protection: Foil is tasteless, odorless, hygienic. Possessing no volatile elements, it cannot taint the product it protects. It helps retain the vitamin content of foods in cooking or in storage. It has no toxic qualities to impart.

Thermal Protection: Foil will reflect up to 95 per cent of radiant heat, a valuable asset for sensitive products.

Protection Against Light: Since foil is opaque, it is a barrier to light. Light can cause loss of flavor, rancidity, staleness, destruction of vitamins and breakdown of physical structure. Quality remains intact.

...and two more that make the foil package perfect

from ALCOA

Machinability: Foil handles extremely well—can be worked with ease. It does not require special equipment or more than minor modifications of present installations.

And Foil Sells: Wherever your product is sold, you can be sure that more people will see your message, spot your brand, if it's packaged in Alcoa® Aluminum Foil. Foil that outshines all the rest. Foil—the natural companion to good graphics.



Entertainment at Its Best . . . ALCOA PREMIERE
with Fred Astaire as Host . . . Tuesday Evenings, ABC-TV

ALCOA ALUMINUM

Oneida puts "Attraction" in flexible packaging!



Give your product the point-of-purchase plus of dynamic packaging—packaging that brings customers running and leads them to the cash register! Oneida has specialized in putting attraction into packaging for over 30 years . . . it's an art that consists of knowing how to combine the right materials, design and construction . . . and incomparably brilliant printing on Oneida's battery of electronically controlled 6-color combination flexographic-rotogravure, and letterpress equipment. And you get prompt service from four strategic plants that serve the nation.

whatever your product...



flexible packaging by



will surround it with



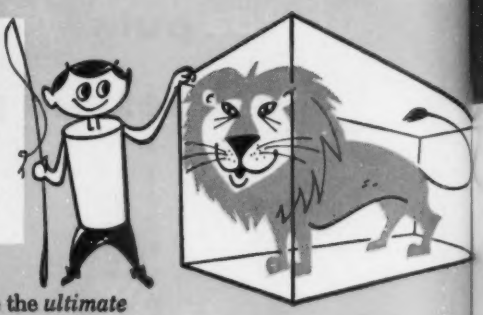
oneida® PAPER PRODUCTS, INC.
10 Clifton Blvd., Clifton, N. J.
Baltimore, Md. • Centralia, Ill. • Los Angeles, Cal. • Sales Offices in All Principal Cities
CONVERTERS AND COLOR PRINTERS OF QUALITY PACKAGING from: Glassine, Cellophane, Polyethylene, Vinyls, Parchment, Sulphite, Foil, Kraft, Waxed, Coated and Laminated Materials.

TO TAME YOUR TOUGHEST PACKAGING PROBLEMS!

NEW Plastic Discovery...

ACLAR*

Fluorohalocarbon Films



From the fluorine research laboratories of Allied Chemical comes *Aclar*—an amazing new family of fluorohalocarbon films. *Aclar* films provide the *ultimate* in moisture vapor barriers—plus transparency, unique impact strength, and flexibility. *How can you use this remarkable combination of properties?*

ACLAR FILMS...



Seal moisture out—seal moisture in... moisture absorption is virtually zero!



Protect products against oxidation



Are crystal clear ... permitting transparent packaging of moisture-sensitive products.



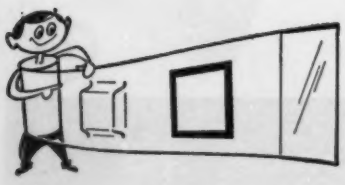
Are t-o-u-g-h ... with amazing resistance to impact, tearing, abrasion.



Are serviceable over a wide temperature range ... retaining many useful properties from as low as −320°F to as high as +390°F.



Are sterilizable by steam, irradiation or chemical means!



Are truly thermoplastic ... can be heat formed, heat sealed or heat laminated using conventional thermal methods.



Are unaffected by almost all chemicals, solvents, and oils. Inert to harshest inorganic acids, alkalies and most organic compounds.

For technical data and other information to help you evaluate Aclar films for your most difficult packaging problems, write or phone Film Department, General Chemical Division, Allied Chemical Corporation, 40 Rector Street, New York 6, N.Y.

Allied Chemical

GENERAL CHEMICAL DIVISION
40 Rector Street, New York 6, N. Y.

*Trademark of Allied Chemical Corporation

U.S.I. POLYETHYLENE NEWS

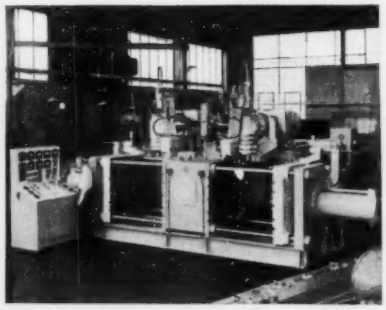
A series of advertisements for plastics and packaging executives by the makers of PETROTHENE® polyethylene resins

Packaging Notes

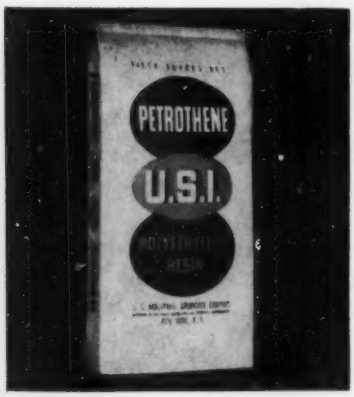


Collapsible 5-gallon jug is being extrusion blow-molded from PETROTHENE polyethylene by a Cleveland concern. This corrosion-resistant container can transport and store virtually any liquid, costs about 90¢ with cardboard carton.

Giant blow molding equipment turns out thin-wall drum liners of polyethylene at the rate of 120 to 150 per hour. The two-station prototype illustrated has produced containers up to 80 gallons in capacity; is considered capable of blowing objects twice the size without difficulty. Molds operate alternately.



New blow molding machine has produced objects 15 to 80 gallons in size, including 55-gallon drum liners of U.S.I.'s PETROTHENE 106 polyethylene resin.



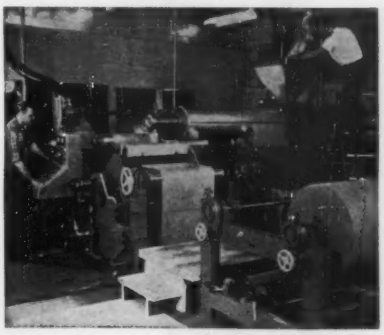
New Bag For U.S.I. Resin

A newly-designed 50-lb. bag now packages U.S.I. PETROTHENE resins. It has an outer ply of semi-bleached Kraft, imprinted with a new 3-oval U.S.I. insignia. Look for this bright white, red and black bag, instead of the familiar red on brown one, next time you order.

Polyethylene Coating: Door To New Packaging Developments

U.S.I.'s PETROTHENE® 205-15 Coating Resin Has A Wide Range Of Properties, Adheres Well To Most Substrates

Paper, paperboard, cellophane, "Mylar," glass fiber (scrim cloth), foil, acetate, parchment — along with polyethylene — all play important individual roles in today's packaging industry. But this is a highly specialized age and the myriad basic materials available are still not altogether adequate. More and more, designers are calling for a combining of the inherent characteristics.



The board coating machine above, located in U.S.I.'s Polymer Research Laboratory in Tuscola, runs at speeds equal to or greater than commercial equipment, duplicates the latter in everything but width.

Extrusion coatings of polyethylene are making possible such property variations, imparting new capabilities to the above materials.

U.S.I. supplies specific polyethylene coating resins for many specific applications, but PETROTHENE® 205-15 is outstanding for its versatility and working characteristics. It's easily handled at high speeds . . . has excellent adhesion, high draw-down, uniformity, and low neck-in — all the properties extruders want. It can be used on almost all porous and non-porous substrates.

To the packager or other user, it offers: unusually high greaseproofness; good heat sealability; low moisture-vapor permeability; good flexibility even at refrigeration temperatures; high chemical inertness; absence of taste, odor, toxicity; economically low coating weights.

Packaging breakthroughs made possible by polyethylene coated material include multi-wall bags with a polyethylene-coated kraft inner ply for shipping dry chemicals, fertilizers . . . individual sugar servings wrapped in polyethylene-coated "pouch" stock . . . liquid milk containers of board stock coated inside and out with polyethylene...grease-resistant machinery coverings of kraft heavily coated with polyethylene.

Moving Industry Adopts Polyethylene Skin Packaging

On-the-spot polyethylene skin packaging is revolutionizing the moving industry. With a new portable machine which can be rolled right into a home and run on any 110-120 volt circuit, barrel packing



can now be accomplished in 25% less time at a 33% savings in material costs. Device applies a tight, 6-mil polyethylene film cover over small or fragile articles, anchoring them firmly to a polyethylene-covered corrugated board. Full cycle is said to take less than 30 seconds. Standard moving barrels are used.

Because of its easy portability, this machine is also being utilized by manufacturers for in-plant packaging of electrical components, spare parts, etc.

Did You Miss These?

Reprints of two recently published articles on polyethylene are currently available through U.S.I.:

1. "Poly Bread Wraps: Growth Continues," 4 pages, by William U. Funk, U.S.I. Sales Engineer.
2. "The Effect of Molecular Weight Distribution on the Flow Properties of Polyethylene," an 8-page technical report of experimental work conducted at U.S.I.'s Polymer Service Laboratories.

If you missed either or both of these timely articles, or would like extras for your file, copies can be obtained by writing Technical Literature Department, U. S. Industrial Chemicals Co., 99 Park Avenue, New York 16, N. Y.



MORE AND MORE...SHE REACHES FOR A POLYETHYLENE-COATED CONTAINER

Milk cartons, other dairy containers that don't leak... don't flake... don't get scuffed. Bakery packages that remain clean... free of grease stains. Frozen food boxes that stay tight... bright ... invite. That's what the consumer wants, and that's what the consumer buys.

Packages made of polyethylene-coated paperboard meet these consumer specifications. You'll find that polyethylene-coated board meets your production requirements, too—in printability, heat-sealability, economy.

U.S.I. has developed special PETROTHENE® polyethylene coating resins for food packaging applications. Ask your supplier about the superior moisture resistance, greaseproofness, toughness, smoothness of these packaging materials. He'll be glad to show you how they can keep the consumer reaching for your product.

U.S.I. INDUSTRIAL CHEMICALS CO.
Division of National Distillers and Chemical Corp.
99 Park Ave., New York 16, N. Y.
Branches in principal cities



Colorful Polyethylene

...offers powerful sales advantages

Every color of the rainbow — from brilliant hues to subtle pastels can be printed on clear polyethylene film. Colorful designs, sales messages and product information on your packages produce attractive showcases that draw buyers to your products.

Polyethylene is economical. Polyethylene is the least expensive high clarity film you can buy. It can be printed economically at high speeds, with sharp registration and good ink adhesion. Add to this the soft, natural flexibility and durability of polyethylene and you have a versatile packaging material that offers you powerful sales advantages.

Colorful polyethylene packages are now being used for a host of applications, including produce, dairy, bakery, laundered shirt packaging, and soft goods overwrap. Packages can be formed on automatic machines . . . sealed by heat.

U.S.I. produces a number of PETROTHENE® resins ideally suited for producing packaging film of every type — clear or printed, thick or thin, tough or tearable, slippery or sticky. Extruders and converters make these films available in a wide range of thicknesses, with a combination of special properties to meet your every packaging need.

Discuss your packaging requirements with your film supplier. He'll be glad to recommend the type of polyethylene film best suited to your particular application.

U.S.I. INDUSTRIAL CHEMICALS CO.
Division of National Distillers and Chemical Corp.
99 Park Ave., New York 16, N. Y.
Branches in principal cities

APPLICATION GUIDE TO

PETROTHENE®

POLYETHYLENE RESINS

The following table lists the principal applications of the most commonly used U.S.I. PETROTHENE® polyethylene resins, along with their main characteristics. Several of the many available compounded resins are listed as well. For almost all applications, a number of resins of varying densities and melt indexes is suggested.

Such a table can only serve as a general guide since it cannot include all possible applications and all resins which are being successfully used by processors. To choose the resins best suited to your needs, it frequently will be advisable for you to contact your nearest U.S.I. Sales Office.

SUGGESTED PETROTHENE POLYETHYLENE RESINS

PETROTHENE®	100	100-210	102-2	106-224	107	112	117	200	201-220	202	203	203-2	205	205-15	206	207	208	209-2	213	215	218	225-2	232	239	250	270	301
Density	0.917	0.917*	0.924	0.937*	0.917	0.921	0.917	0.916	0.916*	0.915	0.915	0.915	0.924	0.924	0.924	0.924	0.924	0.920	0.923	0.928	0.933	0.919	0.923	0.929	0.926	0.912	0.917
Melt Index	2.0	2.0	2.0	2.0	0.4	3.0	8.0	3.0	5.0	22	8.0	8.0	3.0	3.0	5.0	8.0	22	3.0	8.0	8.0	3.0	1.8	2.0	5.0	250	70	1.0
APPLICATIONS																											
Film																											
general purpose																											
(blown)						■					■		■		■	■							■	■			
(cast)						■		■					■										■				
produce bags						■																	■				
garment bags																■								■			
soft-goods bags						■					■				■	■								■			
overwrap, bread wrap (cast)																					■			■			
drum liners	■				■			■																			■
construction	■				■			■																			■
mulch		■																									
skin packaging								■					■														
Pipe				■																							
Extrusion coating and Laminating									■			■		■													
Wire and Cable coating																											■
Calendering																											
Sheet Extrusion and Thermoforming													■					■						■			■
Injection Molding			■				■	■		■	■		■		■	■	■		■	■		■		■	■	■	
Blow Molding			■															■				■					■
Atomic Reactor Shielding	■																										
Blending																									■	■	

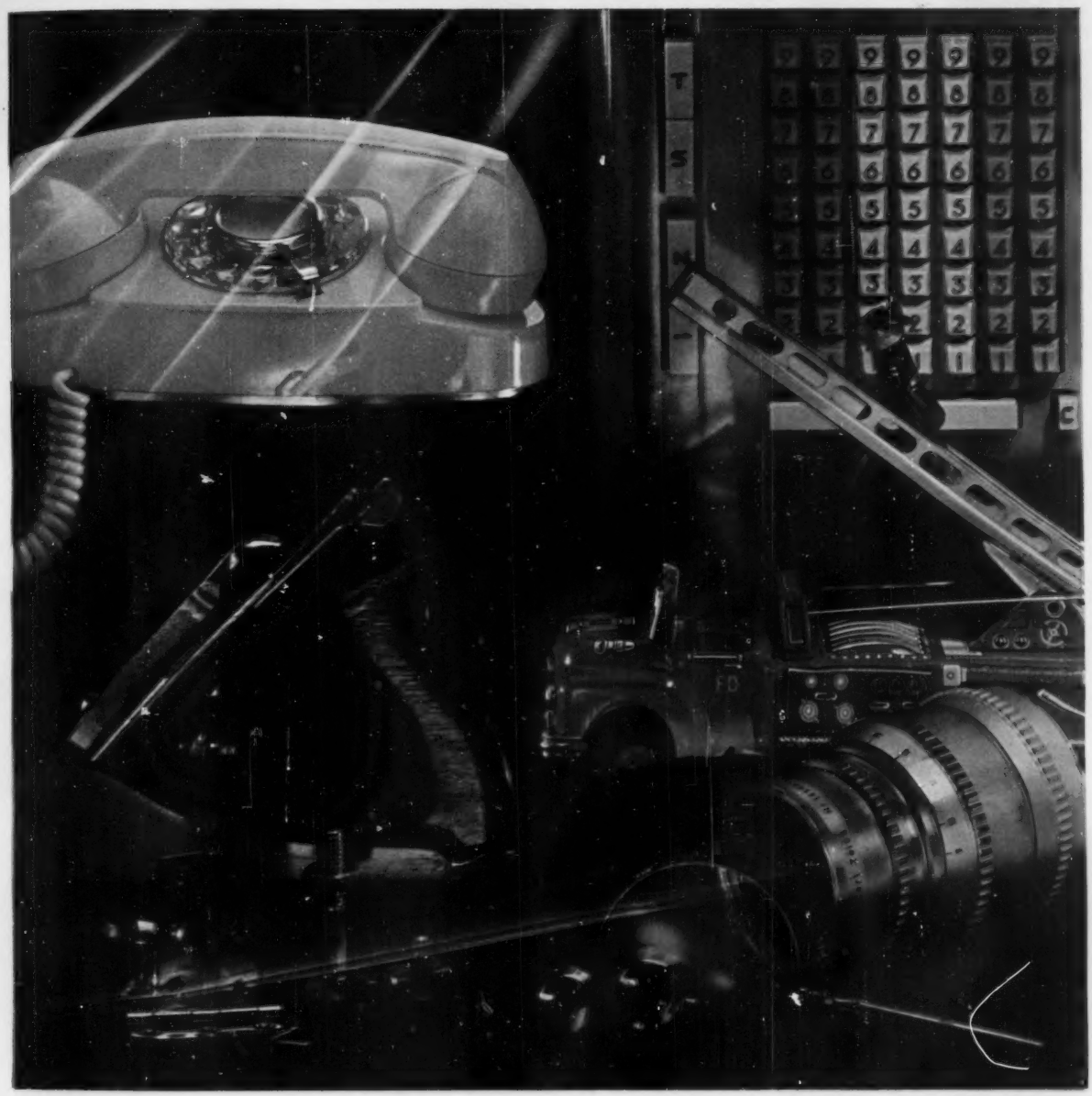
Notes: Technical Data Sheets available for all of above resins. *Density of base resin.

U. S. I. SALES OFFICES

ATLANTA 3, GEORGIA	524-5112	127 Peachtree St., N.E.
BALTIMORE 4, MARYLAND	Valley 5-1141	200 East Joppa Road
BOSTON 14, MASSACHUSETTS	Capitol 7-8140	150 Causeway Street
CHICAGO 5, ILLINOIS	Wabash 2-1650	624 S. Michigan Avenue
CINCINNATI 11, OHIO	Montana 2-1222	3319 Glenmore Avenue
CLEVELAND 13, OHIO	Cherry 1-0073	Rockefeller Building
DETROIT 16, MICHIGAN	Woodward 1-4220	1448 Wabash Avenue
KANSAS CITY 6, MISSOURI	Victor 2-2413	823 Walnut Street 805-6 Waltower Bldg.
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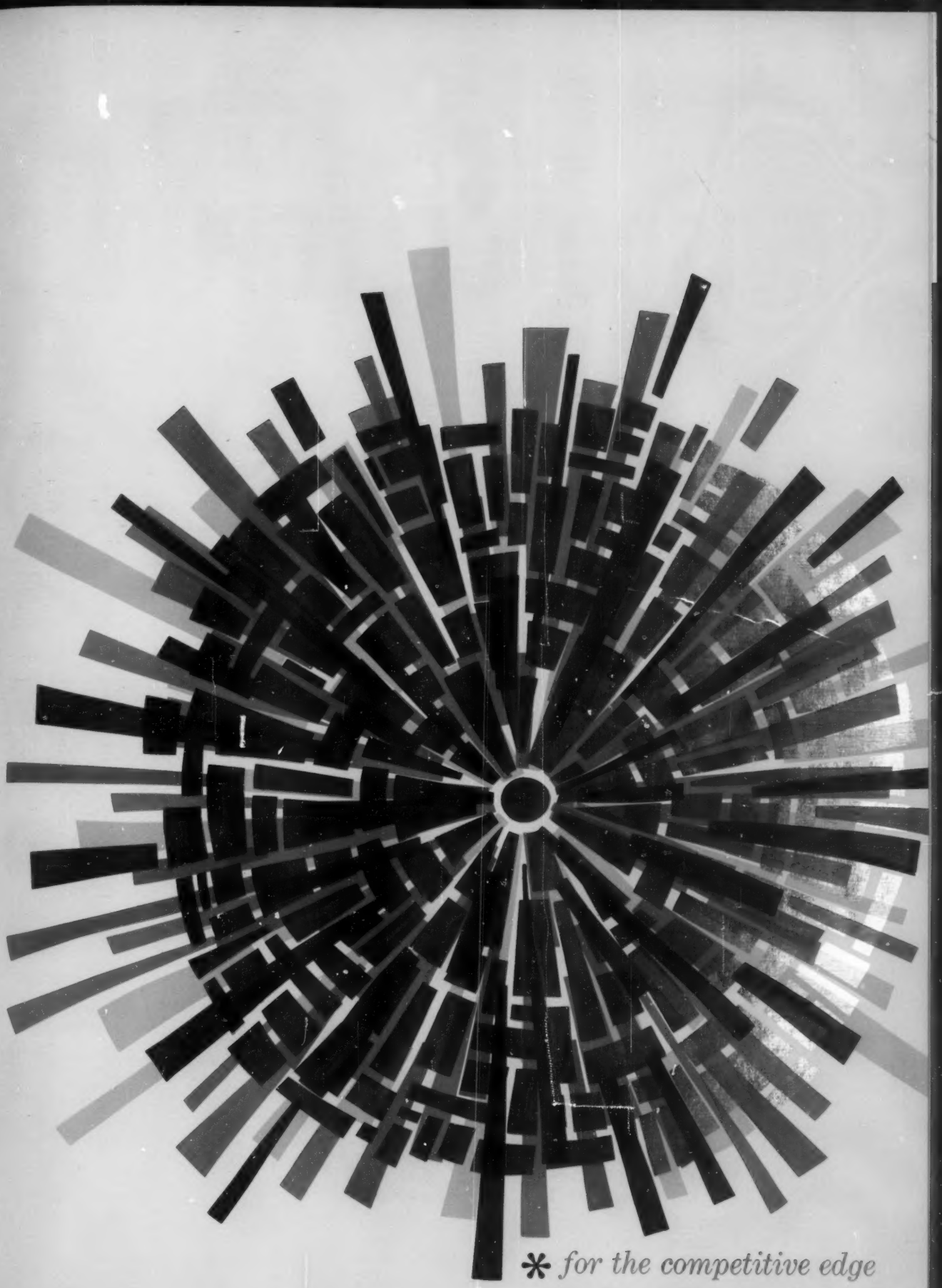


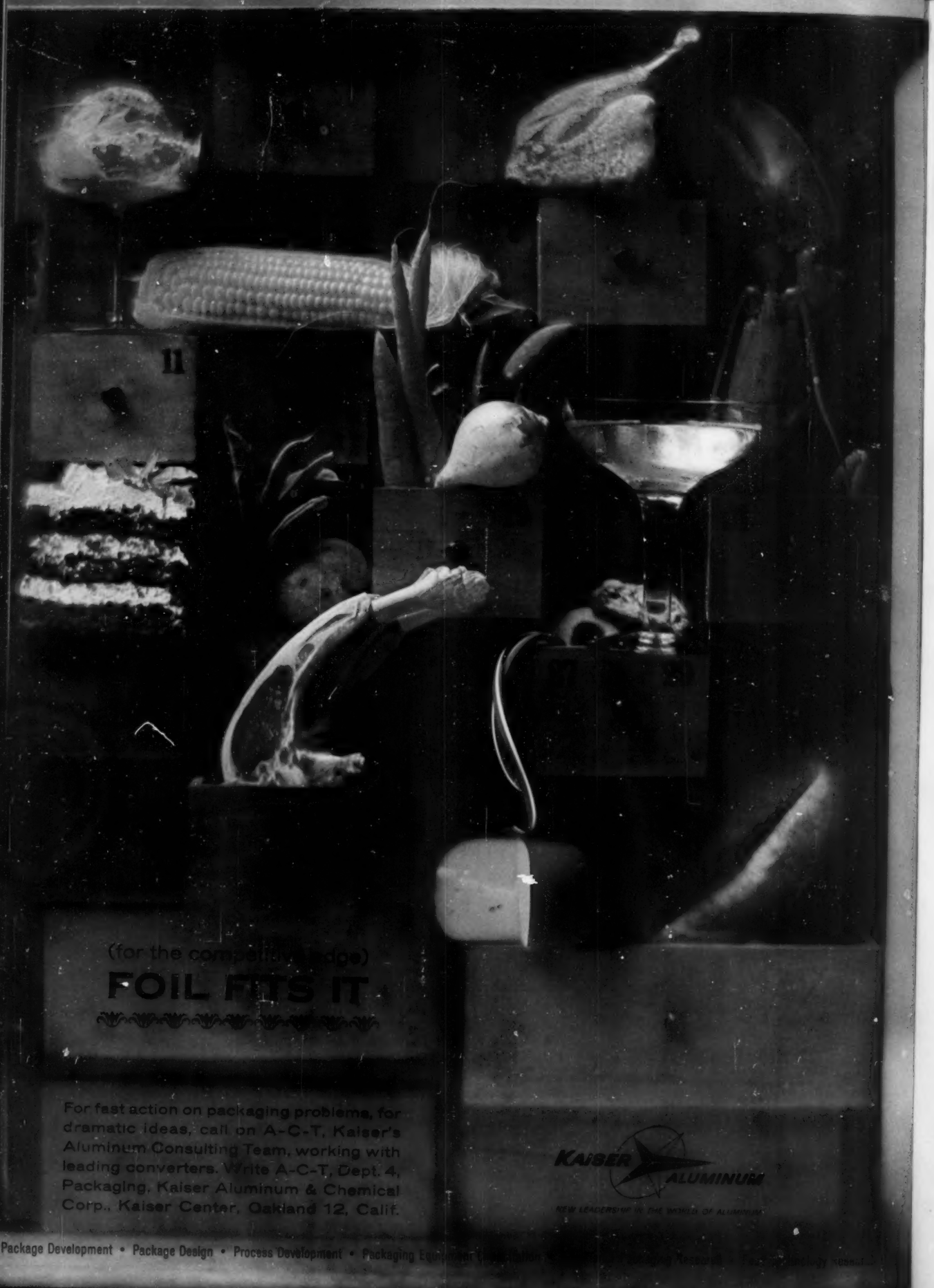
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SECTION 5

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ADHESIVES AND TAPES

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SECTION 5

ADHESIVES AND TAPES

GUIDE TO ADHESIVES

By Sam Schuller*, Edward Bearman** and Harvey Miller†

There are few areas in the entire range of the packaging field where adhesives and related bonding agents are not required. Virtually all paper and paperboard containers employ adhesives in their fabrication. Adhesives are demanded for laminations, for labeling and for many types of seals or closures. Many of the advances with plastics and foil depend on bonding agents. The importance of adhesives in packaging is increasing steadily because the jobs that they must do are growing in variety and complexity.

Functional performance always is involved where packaging adhesives are concerned. This makes it imperative for designers, engineers and others in the packaging field to have a basic knowledge of adhesives in order to develop and produce successful packages. The adhesive-wise packager will be able to obtain optimum results from the technical department of the adhesive supplier, who must make the ultimate recommendations for an adhesive to serve a particular application.

The performance of a packaging adhesive depends on packaging materials, type of machine and its speed, seal strength and type of seal required, package contents, and conditions to which the package will be subjected. Choice of a suitable adhesive for a specific application requires the packager to be acquainted with the various classes of adhesives (vegetable, synthetic or animal based) and their properties, chemical additives that can be employed for modification and forms in which adhesives are applied (water dispersion, hot melt, solvent cement, etc.). Although several different adhesives may be satisfactory for a general application, such as carton sealing, the list of requirements usually will point the way to the one best adhesive for a particular package.

Recent advances

Some of the most prominent advances in packaging adhesives during the past few years have been in easy-clean-up resin emulsions, hot melts and resin copolymers to handle various types of coatings and plastic films now becoming increasingly popular.

Easy-clean-up resin adhesives are used generally for carton and other types of sealing. Modifications in the emulsion allow the skin formed on the surface of the adhesive when the machine is idle to dissolve readily when the operation begins again. Previously, the skin formed on resin emulsions had to be removed to prevent accumulation on roller and gears —and a streaky application. Development of easy-clean-up resin adhesives allows the packager to obtain the advantages of a fast-setting resin adhesive together with the easy-clean-up and redispersibility characteristic of the slower-setting dextrin adhesives.

Through recent advances in hot melts, difficult materials now can be bonded under extremely rigorous conditions. Hot melts have increased in importance because of (1) the growing need for sealing at high speeds and (2) the development of application equipment adaptable to many machines to dispense hot melts in metered quantities. The field also has been helped by the development of hot-melt adhesives in continuous rope-type and granule forms plus equipment to handle them. Previously the high temperatures required to liquefy a hot melt degraded a large quantity of the material. Equipment now available to handle rope or granules heats only a small amount of hot melt at a time and thus avoids degradation of a large quantity.

Recent advances in emulsion technology have provided the adhesives industry with the means to formulate mechanically stable, fast-setting, nonflammable adhesives that will bond to packaging films such as polyester, polystyrene, vinyl, saran-coated cellophane, polyethylene and polypropylene. The new adhesives are based on polyvinyl acetate co-, ter- and quad-polymer emulsions. These multipolymers can meet difficult physical and chemical specifications, such as grease resistance and controlled moisture-vapor and gas-barrier properties. The finished package thus can approach "perfection" for a particular use.

One of the most important recent packaging achievements was the development of new techniques for manufacturing and sealing waxed cartons for food use. Until recently, carton manufacturers and packagers depended on adhesives containing carbon tetrachlorides to penetrate the wax coatings for an effective bond to the board. With legislation in many states outlawing the use of adhesives containing carbon tetrachloride and tightening requirements for odor-free materials, leading manufacturers of adhesives developed modern synthetic

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1Selector chart (opposite) prepared expressly for the ENCYCLOPEDIA by Morningstar-Paisley. Contents copyrighted. Quotations for extra copies on request.

ADHESIVES SELECTOR CHART[1]

LEGEND

1 — Adhesive suitable for application

2 — Adhesive requires special formulation for this application

		Starch Jelly	Unborated dextrin	Borated dextrin	PVAc resin emulsion	PVAc copolymer emulsion	Latex	Casein	Animal glue	Latex-casein	Hot melt (solid resin)	Lacquer	COMMENT
CASE SEALING													
Material	Paperboard coated			2	1						1		Low tensile adhesives for re-usable cases can be provided with resin emulsion or dextrin base.
	Paperboard uncoated			1	1								
Speed (compression)	Below 20 seconds				1						1		
	20-60 seconds			1	1								
	Over 60 seconds			1									
Service conditions	Export				1								
	Water resistance				1						1		
CARTON OR BOX SEALING													
Material	Foil				1	1				1	1		Odor-free adhesives available for food use. Certain clay-coated board stocks may require special resin emulsion adhesives because of nature of binder. Wet waxed board requires more vigorous adhesive action; for example, higher solvent content for greater penetrability.
	Clay coated			1	1								
	Patent coated			1	1								
	Sulphite board			1	1								
	Chipboard			1	1								
	Waxed board				2						2		
Speed (compression)	Below 15 seconds				1						1		
	Above 15 seconds			1	1	1							
Service conditions	Sterilization			2	1	1							
BOTTLE LABELING													
Material (bottle)	Glass	1	1								1		Treated polyethylene bottles can be labeled with starch jelly adhesives or resin. Untreated polyethylene requires resin or latex types. Many thermoplastic label papers depend on special adhesives. They can meet a range of service requirements.
	Plastic	1			1					1			
Equipment	Direct application	1	1	1									
	Indirect application	1	1	1									
	Thermoplastic				1						1	1	
Service conditions	Iceproof							1	1				
	Semi-iceproof	1											
	High humidity	1											
CAN LABELING													
Functions	Hot pickup										2		On operations requiring a lap paste or pickup gum, gum can be hot or cold. Varnished labels require resin lap pasters.
	Lap paste			1	1	1				2			
	Cold pickup		1	1									
BONDING TRANSPARENT FILMS													
Material	Polyethylene					2	2			2	2	2	Lacquers (using special techniques) and hot melts are more suitable for adhering plastic films to themselves or other relatively impenetrable surfaces.
	Cellulose acetate				2	2	2					2	
	Cellophane, moistureproof				2	2	2			2	2	2	
	Mylar and polystyrene				2	2	2			2	2	2	
	Vinyl and saran				2	2	2			2	2	2	
	Cellophane, plain		2	2	2								
	Glassine		2	2	2								
BLISTER AND SKIN PACKAGING													
Material	Cellulose acetate				2	2					2	2	Choice of resin or rubber latex depends on whether a heat-seal or a self-seal bond is required.
	Vinyl film				2	2					2	2	
	Paperboard						2						
Sealing method	Cohesive seal						2						
	Wet combining seal				2								
	Heat seal				2						2	2	
BAG SEALING													
Material	Paper, kraft, sulphite		1	1	1	1	1	1			1		Food packaging requires specialty odor-free and nontoxic adhesives.
	Plastic films				2	1					2	2	
	Waxed paper and glassine		2	2	2	2		2		2	1		
Service conditions	Moisture resistance				1	1	1	1		1	1	1	
	Water resistance				1	1	1	1		1	1	1	

adhesives based on polyvinyl acetate resin emulsions to do the job. Carton and packaging equipment producers cooperated with the research effort of adhesives producers by developing methods and equipment for removing wax physically from the sealing surfaces. This action allows the newer adhesives to produce effective bonds at the highest possible speeds. The adhesives developed in this program not only comply with laws governing toxic materials but also produce a more satisfactory package than available heretofore. The new resin adhesive produces stronger, more water-resistant bonds at faster speeds than the older carbon tetrachloride formulations. In addition, tests have shown that some specialized odor-free adhesives for wax-carton sealing will not produce a trace of foreign odor.

The theory of adhesion

Some knowledge of the mechanics and chemistry of adhesive behavior may help the packager in his job. A number of useful explanations about behavior have been advanced; these help users understand better why certain modifications may be required.

Present theory explains the property of adhesion as the result of attraction brought about by chemical, physical and electrical forces. These forces exert their influence after a three-phase adhesive process: (1) wetting of the surfaces by the adhesive; (2) solidification of the adhesive through evaporation of the liquid, penetration into the packaging surface, or chemical action; (3) final setting of the adhesive for development of maximum tensile strength and bonding power.

All liquid adhesives are composed of: (1) a film former, the essential bonding ingredient, which also provides the major portion of the tensile strength; (2) a vehicle that enables the film former to be applied to the packaging surface; (3) modifying agents such as plasticizers, humectants, penetrants, stabilizers, etc., to adapt the material for a specific application. Strength of the bond is affected greatly by the molecular structure and polarity of the film former. Molecular size or weight, or degree of polymerization of the film former, is vital to adhesive effectiveness.

In general, higher-molecular-weight polymers give bonds of correspondingly higher tensile strength. Polymers of high polarity generally exhibit better specific adhesion than polymers of lower polarity. These properties are of minor importance in paper-to-paper adhesives since even the lowest-molecular-weight polymers generally are stronger than the surfaces being adhered. However, they are of major importance in the formulation of adhesives for nonporous surfaces such as those of adhesives, glass, metal and plastics. Here the bond is achieved not so much by a mutual intermingling of the adhesives with the fibres of the adherend but rather by the mutual attraction between the polymer adhesive and the surface being joined. High polarity favors this mutual attraction.

Furthermore, when used to join relatively nonporous surfaces, many adhesives are of lower tensile strength than the adherends. Consequently the strength of the polymer film former is the limiting factor of the strength of the bond. And this, as indicated, may increase with the molecular weight of the polymer.

The property of tackiness also plays an important role in the functioning of an adhesive. Tack of the adhesive will hold the bonded surfaces together while the adhesive reaches its final set. Tackiness depends on the type of film former, solids concentration, temperature, plasticizer or agents, rate of solvent release by the film former, and atmospheric conditions.

The thickness of an adhesive film will also determine its effectiveness. It has been established that generally the strength of a seal is inversely proportional to the thickness of the glue line, provided that a sufficient quantity of adhesive has been applied to assure film continuity. Probable reason for this phenomenon is the greater risk of flaws in thicker films, just as a long length of fibre will have a lower breaking strength than the average shorter lengths.

Selection of adhesives

Growth of the variety of adhesives now available, plus increased complexity of packaging machinery combined with a great number of packaging materials now used in packaging, have made specific adhesive selection a job for an expert.

Choice of adhesive will be determined by: general type of operation for which an adhesive is required, such as case or carton sealing; type of packaging material used; equipment; speed requirements; conditions to which the package will be subjected, and other factors. The accompanying chart points out the general types of adhesives for specific applications and requirements.

Adhesives fall into broad classifications, according to the materials on which they are based. The four important classes are: vegetable, animal, protein and synthetic materials (resins, latexes). Each of these classes breaks down further into additional groups according to the modifications made to their chemical structure or differences in forms in which they are applied.

Vegetable adhesives

Vegetable adhesives are produced from (1) raw flour and starches, (2) treated or modified starches, (3) dextrins and (4) natural, water-soluble gums. These may be used alone or in combination. Starches used in the formulation of these adhesives include corn, tapioca, potato, wheat, rye and sago. Among the water-soluble gums, gum arabic is of great importance to the adhesive chemist.

In its unconverted form, starch is essentially insoluble in cold water. However, when cooked with water to a temperature of about 170 deg. F., it forms a soft paste with low tack and weak adhesive properties. Stabilizers and preservatives often are used in starch adhesives to make them fit a specific need. However, adhesives derived from unconverted starch have only limited applicability because of low solids content and high, pasty viscosity.

When starch is roasted, especially in the presence of an acid catalyst, it is degraded into dextrin. This material has quick tack and the high solids required for a machinable adhesive. Dextrin has greater solubility than starch in either cold or hot water. Adjustment of the roasting process provides an almost infinite variety of dextrins with solutions of varying viscosities and degrees of tack. The higher the solids content of the dextrin solution, the greater its tack.

Various chemicals may be added to modify the intrinsic properties of the dextrin. Alkalies, acids, salts, plasticizers and solvents in varying proportions may be used to achieve changes in body penetration, flexibility and specific adhesion. Preservatives usually are included to guard against any bacterial and mold contamination.

Vegetable adhesives also may be

modified with resins to achieve greater water resistance and to increase the setting speed on certain machine operations. Major uses for vegetable adhesives include bonding uncoated paper and paperboard to similar products or to glass, such as bottle labeling, bag sealing, sealing and labeling corrugated and solid fibre containers.

Animal glues

Animal glues are based on proteinaceous substances derived from fish, animal hide, bones or leather scraps. These adhesives usually are designated as hide or bone in origin. Animal glues, distinguished by high tack and tensile strength, generally are run as hot solutions that produce bonds at much greater speeds than dextrin products. Their extremely strong bonding action is based on (1) rapid set because of quick moisture loss and (2) rapid gel with a drop in temperature.

Animal glues are available in a wide range of properties. Classification is based on viscosity of a 12½% solution at 140 deg. F. and the strength of the gel on cooling. Compounded animal glues are classified as nonwarps and flexibles and are normally supplied in cake form (used at 140 deg. F.). Chemical additives include plasticizers, such as glycerine, and extenders, such as cane sugar and certain salts. Fields where cake-form animal-glue adhesives are used include set-up and folding-box manufacture. Liquid glue formulations are used as iceproof bottle-label adhesives, though these have been replaced largely by casein-based products.

Casein adhesives

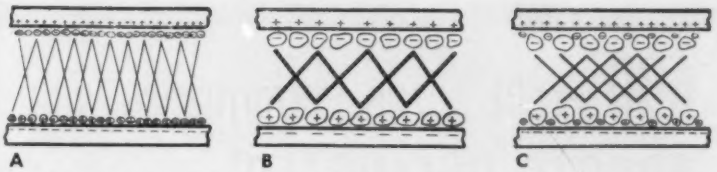
Casein is based on a complex protein obtained from milk by acidification or by treatment with the enzyme rennet. Casein is insoluble in water but can be dissolved by treatment with alkali solutions. Casein adhesives have clean machining characteristics, high tack and fast-setting properties. They often are used with latex and resin emulsions to provide a combination of improved properties, including strength and resistance to heat, oil and water. A major use of casein adhesives is in labeling of beer and soft drinks, where labels must withstand icy water but be easy to remove.

Rubber-based adhesives

Rubber-based adhesives, both synthetic and natural, are supplied as solutions in solvents such as hexane or as water-borne latexes. They are characterized by great pliability and excellent specific adhesion.

An adhesive can be formulated from natural rubber to produce a nontacky film capable of forming an immediate bond when the pre-dried adhesive is brought into contact with another pre-dried natural rubber film. This unique property has given the packaging field its pre-coated boards and papers that are sealable by pressure alone. The instantly formed bond eliminates the need for a drying period on the production line. In addition, the coated board may be stored until needed.

Refinements in cohesive latex adhesives allow the packager to choose between seal-tear or seal-reseal bonds. Uses for latex adhesives include the bonding of manufacturers' joints for cartons, corrugated boxes, envelopes and pouches. These adhesives also are used for pressure-sensitive tapes and labels, as well as for fold-over cards used for blister packs.



MOLECULAR WEIGHT is important in the effectiveness of an adhesive. (A) shows a material with very low polymerization and relatively small molecules. Polarity, and therefore specific adhesion, is high, but there is little cross-linking with resulting low viscosity and tensile strength. (B) represents a material with a high degree of polymerization. Large molecules have low polarity and low specific adhesion, solubility, penetration and wetting. High degree of cross-linking provides high tensile strength. (C) represents an intermediate degree of polymerization with a broad range of molecular weights. This condition provides a desirable combination of properties. Small molecules furnish high specific adhesion and large molecules supply forces needed for high tensile strength. (*Diagram, Morningstar-Paisley*)

Synthetic resin adhesives

Adhesives based on synthetic resins are rapidly being accorded increased interest. Most resin adhesives used today employ a thermoplastic material such as polyvinyl acetate for the basic raw material. Polyvinyl acetate adhesives have practically revolutionized the adhesives industry in the past twenty years because of their capacity to bond difficult surfaces with high speed and efficiency and to produce water-resistant bonds.

Polyvinyl acetate resin emulsions are water-borne systems containing approximately 55% solids. The emulsions are compounded further by the adhesives producer to develop the physical and adhesive properties required for a specific packaging job. One of the most important advantages of this resin adhesive is its complete synthetic character, which allows the required properties to be engineered into the base emulsion. For example, setting speed and rate of penetration of the adhesive into the substrate can be controlled by varying the particle size of the dispersed resin and the type of emulsifying system.

High-speed packaging machines, which usually exert a strong, constant beating action on the adhesive, would coagulate the emulsified resin if its mechanical stability were low. This property is controlled accurately by varying the emulsifying system. Typical uses for polyvinyl acetate adhesives include sealing of frozen food cartons, milk containers, bags, plastic films and the like.

Inorganic adhesives

The major adhesive based on inorganic chemicals is water glass, or sodium silicate solution. Applied as a liquid, this material crystallizes into a glass on setting. However, the glass particles constitute a hazard when the seal is broken. Sodium silicate adhesives are being replaced by dextrin types for this reason. Sodium silicate has been used mainly for case sealing.

Application

The same basic materials may be used in a number of ways for application to the package. Starches, dextrins, caseins and animal glues usually are applied in a water dispersion. A resin such as polyvinyl acetate may be applied as a water dispersion, solvent combination or hot melt.

Water dispersions. Adhesives usually supplied as water dispersions (or

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water emulsion) include starch, dextrin, casein, animal glues, natural latex, polyvinyl acetate, acrylics, butadiene styrene, Neoprene, acrylonitrile butadiene, and urea and phenolic formaldehydes. Advantages of adhesives in water-dispersed form include ease of clean-up and handling, economy, and elimination of fire hazards, toxicity and odor nuisance posed by organic solvents.

Resin particles are subdivided into microscopic size and kept permanently suspended in water to form an emulsion adhesive. These adhesives have grown constantly in scope and variety to meet a great number of applications and provide results impossible to attain with other forms of adhesives.

Adhesives in water-dispersed form are used throughout the packaging field.

Lacquers. Adhesives in lacquer form substitute an organic solvent for water as the vehicle. They require the use of organic solvents for thinning and for cleaning the packaging equipment. Materials normally employed in lacquer form are polyvinyl acetate, nitrocellulose, and natural and synthetic rubbers. Lacquers are used in the manufacture of cellophane bags, heat-seal coatings for skin and blister packaging, and laminating operations.

Hot melt. Materials normally employed as hot melts are derived from thermoplastic resins such as polyvinyl acetate and ethyl cellulose. Other materials include waxes, gutta percha and asphalt. These must be heated for application in a liquid state. They contain no water or organic solvents. Gluing equipment normally requires special modification to attain the heat necessary to apply these adhesives. Clean up is accomplished with organic solvents. Some principal uses of hot melt are: the label pickup in can and bottle labeling, tear tapes, bonding impermeable surfaces and in blister and skin packaging.

Heat seal. Resins and latexes in emulsion-lacquer or hot-melt forms may be applied to paper, plastic film, foil and the like, and then dried to create a film that will bring about an adhesive bond when heated. One great advantage is high speed. Heat-seal bonding is used on paper, cloth, foil and transparent films, especially in skin and blister packaging. It is also used for heat-seal or thermoplastic labeling, especially for pharmaceutical containers.



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Summary of packaging adhesives: types,

Types and properties	*Uses*
Vegetable adhesives[1]	
PASTES. Usually light colored. Some very short, buttery, break down on agitation; others gummy and maintain viscosity on agitation. Some semifluid, soft. Borated types quite fast setting. Starchy unplasticized pastes are slightly moisture-resistant, high-humidity and sterilization resistant. Heavily plasticized pastes, good nonwarp qualities. Most are acid *p*H; few neutral; borated pastes are alkaline.	Bag bottoms, hand labeling, lap paste, mounting, laminating convolute tube winding, end sealing, cup winding.
JELLY GUMS. Rubbery, cohesive, gummy. Some moisture resistance, good high-humidity and sterilization resistance. Referred to as "semi-iceproof." Excellent final adhesion and non-crystallizing characteristics. Many on alkaline side for better stability and adhesion on oily or greasy bottles. A few on acid side, to give lighter color. Colors (white, amber, reddish brown, etc.) depend on composition and *p*H.	Limited by cohesiveness. High-solids types for full or semi-automatic bottle labeling. Modified forms for foil-paper laminates. Lower solids for table gummers, hand operations.
BORATED DEXTRINS. Color range—white to dark brown. Most are fluid, filmy, comparatively fast-setting materials. Some special soft, short, buttery types classified as pastes. Generally have fairly good high-humidity resistance and final adhesion—especially the less-converted types. Used at medium to thin consistency to avoid stringing or cottoning and to assure proper spreading characteristics. Alkaline *p*H.	Case, carton sealing; tube winding, tightwrapping, bag seams, lining, laminating, sizing, wrapping; folding boxes, stripping, lap paste; bag sealing, duplexing. Labeling.
UNBORATED DEXTRINS. Color range—light yellow to dark brown. Brown is usual color. The unplasticized types are high solids, usually fluid, tacky, fast drying. Most of these can be spread in a thin film and applied by machine at a comparatively heavy consistency. Are valuable where high initial tack and fast drying are necessary. Usually on acid side (normal dextrin *p*H) unless adjusted for some special need. Some modifications for the envelope trade have moderately good noncurl properties. Types for back seams and glassine windows are slow drying, have good lay-flat adhesion.	Envelopes, Brightwood and stencil gums. Carton sealing, lacing, bottle labeling, remoistening adhesive on gummed labels and stamps. Cold pickup gum for can labeling.
GUM ARABIC. Light color, tacky, fast drying. Less sensitive to humidity block than most unborated canary dextrins. Not so short as most dextrin products on stencil and transfer operations. Are on the acid side.	Some wrapping and stencil operations. "Tropical front seal" for envelopes (to resist blocking).
Animal glue adhesives[2]	
NONWARPS. Usually supplied in an 8- or 10-lb cake or slab. Used at 140 deg. F. Good lay-flat properties. Dried film not necessarily flexible. Good tack. Drying range, setting speed are adjusted in formulation. Long tack range products called bench or table glues. Most are light in color, have strong, "chewing gum" tack.	Set-up box tightwrapping and stripping. Covering glue in luggage trade. Lay-flat mounting and laminating.
FLEXIBLES. Physical appearance similar to nonwarps. Used at 140 deg. F. Formulated with plasticizers which give flexibility to dried film. Flexible glues usually also nonwarp. Permanent moisture retention gives high degree of grease resistance. Available in fast- or slow-setting grades for machine or hand operations.	Applications in box and luggage trades where flexibility and pliability are required. Greaseproof coatings. Padding.
GLUE JELLIES. Essentially animal glue pre-dissolved and preserved for the convenience of the user. Solid jelly at 70 deg. F. or below. Liquefies quickly as temperature is raised. Supplied in drums of 5- to 55-gal. size. Usually neither flexible nor lay flat.	Primarily on some machines for setting up shoe boxes.
LIQUEFIED ANIMAL GLUES. Fluid at room temperature. Color may vary from light tan to dark brown. Properties vary widely depending on end use. Iceproof gums are formulated to jell in cold water and hold labels on bottles. Others are formulated for use as re-moistening gum. Some string and cotton. Types intended for machine application are shortened to prevent this.	Iceproof gum for beverage bottles. Remoistening adhesive for specialty gummers. Wood gluing. Manifolding or collating. Make-ready adhesive in folding-box plants.

* Prepared by William W. Sederlund, Manager, Packaging Adhesives Technical Development, National Adhesives Div., National Starch & Chemical Corp., New York City.

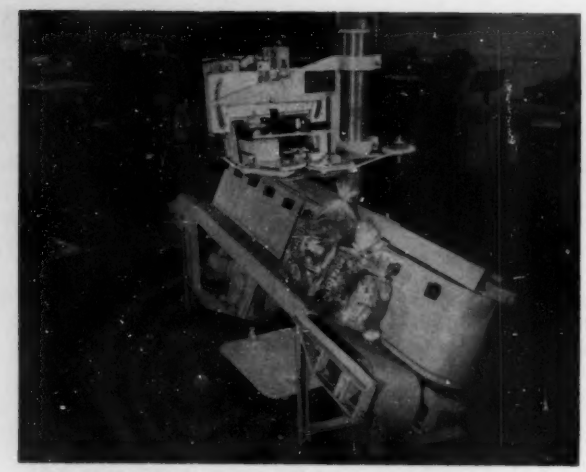
1 Vegetable adhesives as a group are soluble in and miscible with water. Insoluble in organic solvents. Usually intended only for paper-to-paper, paper-to-glass and similar applications. Unless specially formulated, will not stick to ink, varnish, resin-coated surfaces, etc.

2 Animal glue adhesives are soluble in and miscible with water. Insoluble in organic solvents. Dried films exhibit good strength. Good adhesion on difficult paper stocks (no ink, varnish, etc.). Normal *p*H slightly acid.

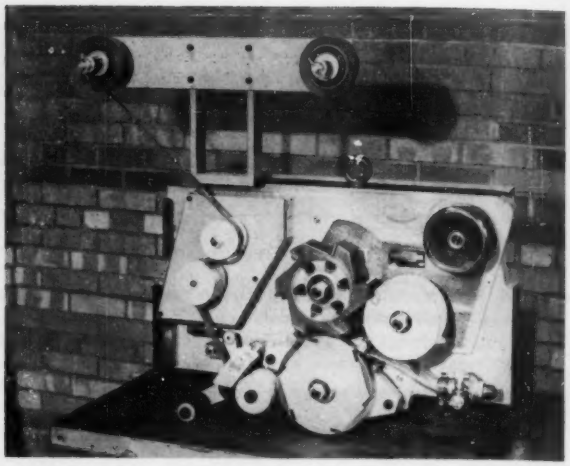
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properties, uses*

Types and properties	*Uses*
Casein adhesives	
CASEIN. Moderate to high water resistance. Many require ammonia or alcohol as diluents. Dried films usually soluble in alkaline solutions. Fairly light color. Dried films strong and continuous. Usually better than vegetable or animal glues for adhesion to plastic, inked, lacquered, varnished, etc., surfaces. Usually alkaline *p*H.	Iceproof glue for cold-drink bottling, case sealing, tin labeling, strip stamping, labeling over varnish, tube winding, pigment binder for paper coating.
Resin adhesives	
EMULSIONS. Most based on polyvinyl acetate. White or light-colored, opaque liquids. Fluid or pasty. Acid *p*H. May contain solvents. Most give strong, continuous dried films. Water-resistant types may give fairly hard, stiff films. Those formulated for adhesion to foil or plastic films, cellophone, etc., and for padding give soft, flexible films. Many give thermoplastic films. Outstanding for final adhesion, fast setting, light color, humidity, grease and mold resistance, etc. Thinned with water. Highly water-resistant films may require solvents (acetone, acetone-water) for removal. A few fast-set types have comparatively poor water resistance for easy cleaning.	Case and carton sealing, tube winding, paper cups, milk containers, envelopes, folding boxes, trays, greaseproof coatings, heat-seal coatings, cellophane and acetate windows, cellophane bags, padding, paper-bag seams, bag sealing, bar wrapping. Glued lap (manufacturer's joint on shipping cases).
LATEX ADHESIVES. Based on natural or synthetic rubber latex; some on reclaimed rubber dispersions. White to black opaque liquids depending on base and formulation. Usually alkaline. Some have ammonia odor in liquid state; others, characteristic odor of base synthetic latex. Most give flexible and pliable films. Some permanently tacky; others have self-seal property. Permanent strength and adhesion of those based on synthetic latexes better than those based on natural rubber latex. Should avoid copper (brass, bronze, etc.) in glue pots, with natural rubber latex, for small amounts of copper accelerate oxidation and degradation of film. Adhere to variety of surfaces, such as ink, varnish, lacquer, foil, plastics. Thinned with water. Dried films usually very water resistant; may require naphtha, etc., for cleaning.	Foil-to-paper lamination. Pliofilm and polyethylene bags, labels to inked and varnished surfaces, case-liner fabrication and sealing, water-resistant drum and container labeling, self-sealed bag and container closures, self-sealing, pressure-sensitive coating for cards used in blister packs, bag adhesives for wet-waxed surfaces, padding.
LACQUERS. Term lacquer is loosely used to describe an adhesive containing organic solvents rather than water as the vehicle or solvent for the resin solids. Water-white to dark brown. Based on nitrocellulose, polyvinyl acetate, synthetic rubber, etc. Setting and drying speeds depend on types of organic solvents used. Most are free-flowing liquids. Some dry to hard, tack-free films. Others—used on cellophane, cellulose acetate, vinyl, polyester films, etc.—retain a soft, tacky, flexible film. Not water miscible. Organic solvents used for thinning and cleaning. Not required or recommended for adhering plain paper surfaces together. Most lacquers flammable.	Cellophane bags, window cartons, waterproof labeling and overcoating, heat-seal coatings (e.g. coatings on cards used for skin and blister packs), gloss and greaseproof coatings, plastic-film laminations, rubber to metal, metal to metal. On cellophane-bag and laminating machines, hand jobs.
SOLVENT ACTIVATORS. No resin content. Included with resins because of end use. Consist of solvent-plasticizer combinations that dissolve or fuse plastic films and make them adhere. Can be used with heat sealing to improve bond. Usually light-colored, water-thin liquids. No diluting or cleaning required. Many flammable.	Wrapping and heat-sealed bag operations involving plastic films.
HOT MELTS. Solid or semi-solid combinations of film former, tackifying resins, plasticizers, waxes, etc. Contain no water or organic solvents; may be considered 100% solids. Must be heated to liquefy for use. White to dark brown depending on composition. If based on wax or crystalline resins, liquefy over comparatively narrow temperature range but usually lack toughness and adhesion at low and high temperatures. Those based on high-molecular-weight resins are harder to use because they lack well-defined melting point, require higher operating temperature; give better toughness, adhesion and flexibility at high and low temperatures. Tough viscous hot melts available in granular or rope form for application by extruders or other special applicators. Hot pickups for can labeling are formulated primarily for instantaneous high tack—not final adhesion. Some hot melts used in laminating and coating for faster operating and more compact equipment. Need no drying tunnel.	Laminating, coating, heat-seal coating, laminant in barrier papers, can labeling, splicing, tear-tape application, strip coat for metal parts, milk-container manufacture, tube winding. Heat-seal coatings for board stocks used in blister and skin packaging. Bag seams, case and carton sealing. Quick sealing of materials which have low permeability to water or solvents.
EXTENDED RESINS. Resin emulsions and aqueous solutions of resins plus starches, inert fillers, etc. Provide some advantages of resin adhesives (water resistance, final adhesion and grease resistance) at lower cost. Do not adhere cellophane, plastic films, foil, etc. Usually slower setting, less flexible than straight resin adhesives. Light-colored, opaque materials. May be fluid or pasty. Water used for diluting and, in most cases, for cleanup. Usually acid *p*H. Few neutral or slightly alkaline.	Case sealing, carton sealing, tube winding, milk-container manufacturing and sealing, folding cartons, bottle carriers, paper cups, bag seams and bottoms, pre-coat for printing, laminating, mounting, straw winding.



AUTOMATIC bag sealer. Seals polyethylene bags with a single piece of pressure-sensitive tape—up to 100 bags a minute, depending on bag size and conveying system. Bags are automatically gathered, tape applied, cut and buffed, discharged.



VACUUM WHEEL applicator automatically applies precisely cut lengths of tape to a moving object, at 2,500 lengths a minute. Handles paper or acetate fibre tapes. Designed to coordinate with high-speed packaging applications.

Guide to packaging tapes

A broad categorization of tape for packaging uses can consist of their three major applications—sealing, reinforcing and banding. These uses are served by two major types of tapes—gummed and pressure sensitive.

Standard gummed tapes consist of a kraft paper backing and water-activated animal or vegetable glue, or a dextrin adhesive. Normally brown, these tapes are produced in a wide range of colors and they also may be printed.

Available in paper having ream weights of 35, 60, 90, 100 and 160 lbs., gummed tapes are usually sold in widths to fit the sealing-tape equipment which applies water.

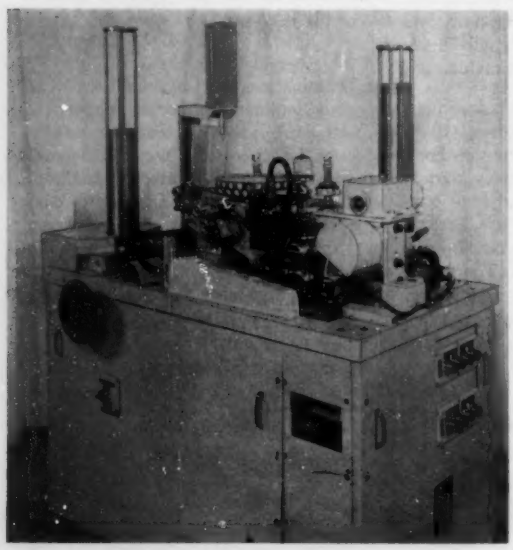
Stay-paper tape is coated with a special high-test glue. It is designed to be applied over stitches and is used to reinforce corners of lightweight paperboard boxes.

Reinforced kraft has glass or nylon fibres that are embedded length- or crosswise, or both, in an asphalt or rubber-base layer between two layers of kraft paper.

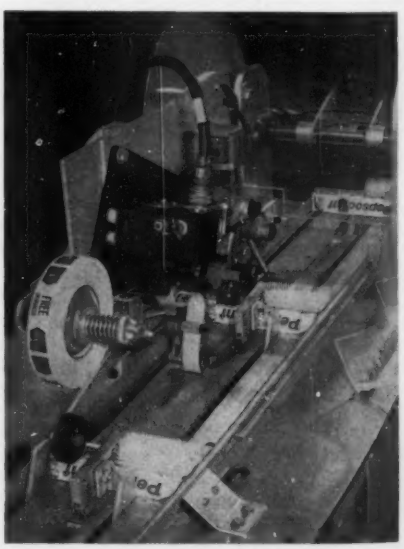
Corrugated cambric. This is essentially a gummed cloth tape used for the manufacturer's joint. It is produced by impregnating the cloth with clay or laminating it to kraft paper.

Waterproof sealing tape. Asphalt-laminated kraft paper is treated with an adhesive that "sets up" after activation with a special solvent.

Pressure-sensitive tapes are aggressively and permanently tacky at room



TAPE STAPLER machine automatically attaches different sized products to cards with a single tape clip—at 60 strips of tape a minute. Used for special promotions, such as attaching pencils to postcards.



BUNDLER uses printed tape to combine retail deals. Here it is taping cartoned toothpaste and premium brush, at 40 combinations a minute.

(All photos this page, Minnesota Mining & Manufacturing Co.)

Pressure-sensitive tape applicators*

Machines that dispense and apply pressure-sensitive tapes have become an important tool for solving special packaging problems. There are well over 100 different types ranging from simple hand-operated dispensers to custom-built machines that can apply up to 2,500 strips a minute. Units are available for labeling, bag and carton sealing, unitizing, banding, bundling, carding and many special chores. Some representative types are shown here.

TYPE	FUNCTION	TAPES HANDLED	RATE/MIN.	REMARKS
Standard-model taping heads[1]				
Automatic bag sealer	Gathers and seals plastic bags — to 10-lb. capacity	Crepe, flatback, acetate fibre, filament	80 bags	Widths to ½ in. Lengths to 2¾ in. Tabber, coder attachments available
Combination bundler	Combines boxes, bottles and irregular-shaped objects	Flatback paper, crepe paper, acetate film	75 combinations	Width to 1 in. Length varies with product. Register and cut-off available
Flat surface applicator	Applies tape to flat, rigid surfaces	Crepe, flatback, cellophane, vinyl[2], acetate	75 units	Widths to 1 in. Length varies with product. Register and cut-off available
Pad applicator V-wheel feed	Applies tape to a wide variety of products	Crepe, flatback, cellophane, vinyl[2], acetate, filament	300 units	Width to 1⅜ in. Length to 3¾ in. Register and cut-off attachments
Standard-model label stock dispensers				
Manual dispenser	Dispenses pre-cut, preprinted tapes for labeling	Label stock	—	Tapes can be supplied in almost any shape and size
Automatic dispenser	Dispenses pre-cut, preprinted tapes for labeling	Label stock	15 ft.	Tapes can be supplied in almost any shape and size
Custom-built applicators and dispensers				
Wide throat bag sealer	Seals bags (or tapes bundles) with neck diameters ½ to 1¼ in.	Acetate fibre, crepe paper, flatback	16 units	Handles tape widths to ½ in. Length varies with product
Air-operated box sealer	Seals telescoped boxes	Filament, flatback	25 units	Handles tape widths to 1 in. Length to 10 inches
Automatic carton taper	Seals cartons	Filament	8 units	Handles tape widths to 2 in. Length varies with product
Automatic can bundler	Combines 2 or 3 round cans	Flatback, crepe, plastic	40 units	Handles tape widths to 1 in. Length varies with product
Automatic can sealer	Seals round cans	Crepe paper, plastic, cellophane, vinyl[2]	60 units	Handles tape widths to 1 in. Length varies with product.
Automatic bander Type A	Wraps products ¼ to 10 in. diameter	Flatback, crepe paper, acetate fibre, film	20 units	Handles tape widths to ¾ in. Length varies with product
Automatic bander	Wraps products 2 in. square to 12 in. square	Filament	6 units	Handles tape widths to 1 in. Length varies with product
Semi-automatic lid taper	Applies tape to pre-punched lids	Flatback paper	60 units	Handles tape widths to 1½ in. Length to 3¾ in.
Automatic lid taper	Applies tape to pre-punched lids	Flatback paper	300 units	Handles tape widths to 1½ in. Length to 1½ in.
Automatic tape stapler	Attaches products to cards with tape clip	Flatback paper	60 units	Handles tape widths to 1 in. Length varies with product
"U" clip applicator	Applies "U" clip of tape to objects 1 to 8⅜ in. wide	Flatback paper, crepe paper, filament	45 units	Handles tape widths to 2 in. Length to 28⅜ in.
Vacuum wheel applicator	Applies tape to objects or a material web	Flatback paper, crepe paper, acetate fibre	2,500 units	Handles tape widths to 2 in. Length to 12 inches
Conduit bundler	Wraps bundles of conduit	Filament	6 units	Handles tape widths to 1 in. Length varies with product
Bonding film dispenser	Removes liner and dispenses bonding film	Bonding film	—	Handles tape widths to 15 in. Length varies with product
Textile splicer	Removes liner; provides heat and pressure to activate bond	Bonding film	1 unit	Handles tape widths to ⅜ in. Length varies with product
Semi-automatic wire and harness taper	Bands group of wires	Paper, vinyl, filament, acetate fibre	Operator efficiency	Handles tape widths to ¾ in. Length varies with product

* Source: Minnesota Mining & Manufacturing Co., St. Paul, Minn.
[1] Handle a variety of taping jobs. Readily fit into existing production lines or conveying systems and can be adapted for other jobs where speed and economy are important.
[2] Vinyl tape must be a special unplasticized type, such as "Paklon."

temperature and adhere to a variety of dissimilar surfaces with nothing more than hand pressure. Pressure-sensitivity can be varied within a wide range by the nature of a single component or a combination.

A backing may be any continuous material—paper, cloth, synthetic film or a combination of these—which holds an adhesive and is flexible enough to wind into a roll and unwind without breaking. Service characteristics, such as tear resistance, strength, toughness, conformability, color, printability and resistance to moisture, chemicals and weathering, are related to the backing material.

The adhesive compound applied to the tape backing supplies the tape with its ability to hold to other materials. Service characteristics commonly provided by the adhesive are high quick-stickability, internal strength, shear resistance (resistance to a sideways force) and needed durability.

Adhesive properties also may be affected by the type of backing. Rough backing materials, such as cloth, have lower quick-stick values than tapes with flat paper or plastic backing, but rough backing provides a greater adhesive anchorage.

Almost all adhesives for pressure-sensitive tapes are formulated from a rubber, or elastomer, and a resin. The elastomer provides internal

Packaging tapes—types and uses*

PRESSURE-SENSITIVE TAPES

PAPER TAPES. Least expensive, paper tapes have a range of backings from light 27-lb. crepes to heavy 13-mil flatback papers, and a variety of adhesives, providing over 50 constructions for different uses. Strength and tear resistance are generally lower in paper-backed tapes than in most others. This is advantageous for packaging needs where ease of tearing will lower dispensing and applying time. *Crepe* affords conformability and has greater stretchability and edge roll capacity. *Flatback* tapes are stronger than the crepes and have greater stiffness and rigidity. Some crepe and many flatback tapes can be printed. Both can have *reinforced* adhesives for heavy duty. *Double-coated* tapes have adhesive on both sides to join two surfaces with no exposed tape. *Protective* tapes provide two-layer protection: paper backing plus continuous-film adhesive.

FILM TAPES. Most widely used for packaging of the pressure-sensitive tapes, film tapes include: *Cellophane*, prized for low cost combined with clarity, tensile strengths up to 30 lbs./inch width, printability and color range. *Acetate film* adds moisture resistance primarily. *Acetate fibre*, made of acetate film laminated to rope fibre tissue paper for strength, has tensiles up to 35 lbs./inch of width, is tougher than acetate film, printable and available in clear or colors. *Vinyl* tapes have 9-23 lbs./inch of width tensile and 3-10 mils thickness, and provide greater toughness, abrasion resistance, conformability, and resistance to moisture and chemicals; and are made in many colors, some printable. *Polyester*, the toughest flexible plastic tape, affords still better chemical resistance and can have tensiles of 24 lbs./inch width in 2-mil thickness; in transparent or colored, many printable. *Double-coated* film tapes, primarily cellophane, are available with or without liners. *Reinforced* film tapes, many printable, are mainly acetate and polyester films reinforced with rayon or glass filaments. Tensile strengths are up to 500 lbs./inch width.

METAL FOIL TAPES. *Aluminum foil* tapes offer many specialized advantages, including a high-performance seal against water-vapor transmission despite temperatures —65 to 200 deg. F. *Lead* tapes are used where properties of lead are needed in the seal.

CLOTH TAPES, mostly cotton, have tensile strengths of 35-65 lbs./inch width. The *coating*, usually plastic, adds waterproofness plus oil and solvent protection, and permits quicker-sticking, longer-lasting adhesives.

GUMMED TAPES

STANDARD GUMMED TAPES are of kraft paper with water-activated glue or adhesive, in various colors and weights, printable, in widths to fit sealing machines that apply water. *Reinforced kraft* has filaments between two layers of kraft. *Waterproof sealing tape* has an asphalt-treated kraft with an adhesive that sets after solvent application. *Stay paper* has a high-test glue for reinforcing corners of lightweight boxes. *Corrugated cambric* strengthens the manufacturer's joint.

* Source: Minnesota Mining & Manufacturing Co., St. Paul, Minn.

strength and the resin, the adhesion.

The paper-backed tape family divides into two types—flatback and crepe. Flatback has the appearance of smooth flat paper, as its name indicates, and crepe has a crinkly, rough appearance. Both are available in a variety of colors and thicknesses.

Crepe-paper tapes are usually not as strong as flatback grades, but they have greater stretchability, edge roll capacity and conformability. Stiffness and rigidity are greater in flatbacks.

Strength and tear resistance are generally lower in paper-backed tapes than in most others. This is advantageous for packaging needs where ease of tearing is needed to save time.

Crepe-paper tapes have found wide use in bundling small parts and in recoopering shipping containers at freight depots.

Colored, paper-backed tape now is used for a variety of packaging methods and is providing packagers new ways for promoting, merchandising and sampling canned products.

Water-resistant flatback tape, designed primarily for carton sealing, has a high-tack adhesive able to withstand severe temperature and humidity conditions. It will take 50% more rough handling than similar tapes when dry and 400% more than other water-resistant tapes when wet.

The film-backed tape family consists of cellophane or a plastic film which for the most part determines its properties and use characteristics.

Cellophane is the oldest and most widely used film; tapes are produced in transparent, colored and in printed form. Cellophane tape is not normally recommended for use where high humidity or moisture is present. There are many uses for cellophane tape.

Acetate-fibre tape is a laminated tape composed of cellulose-acetate film and rope-fibre paper—a good moistureproof tape. Water-vapor transmission rates as low as 1 gm. per 24 hrs. per 100 sq. in. are available.

The tape is applied to seal moistureproof paper wraps and V-board boxes. It also is used to seal cans requiring greater protection than that afforded by cellophane tape.

The tape is available in color and can be printed. Special constructions are available for taping waxed cartons and specially treated papers.

One type of plastic-film tape has vinyl backing, giving this tape group outstanding characteristics: high stretchability, conformability; abrasion, moisture, corrosion resistance.

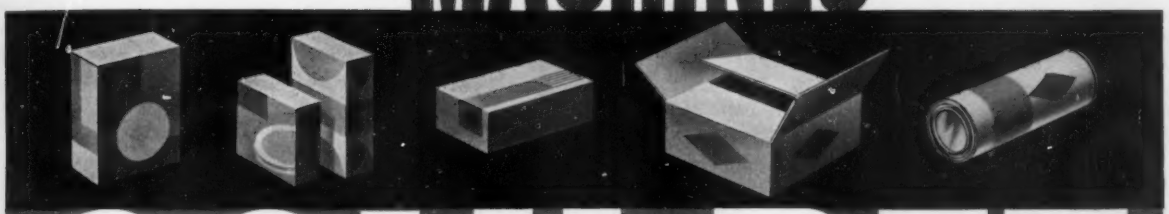
Vinyl-film tape is used for various types of can closures to obtain the best possible moisture seal. This application has had special emphasis by companies supplying aircraft and other engine parts to the armed forces.

Another important development in plastic film tapes is the use of tough polyester backings. Tapes constructed from these materials have good resistance to abrasion, chemicals, oils and temperature. The films can be given a gold or silver appearance.

Cloth tapes from coated and uncoated cloth backings are employed in sealing cartons and in bundling light articles. Coated cloth tape is used with acetate-fibre tape to seal water-resistant wraps and cartons.

Filament-reinforced tape has strong tensile strength and extremely strong tear resistance obtained by embedding thousands of filaments in the tape material. Reinforced tapes are available in pressure-sensitive or gummed types—each serving different needs. Principal reinforcement fibres are glass and rayon filaments. Both types of reinforcement are excellent, and selection of glass-fibre or rayon-reinforced tape is generally determined on a basis of individual requirements, such as degree of strength, stretchability and similar properties needed for economical performance. Tensile strengths from 75 lbs. to 500 lbs. per inch of width are available.

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Using molded pulp effectively

Molded pulp is a fibrous material made from new wood pulp or reclaimed paper stock. It is soft and resilient to the touch, light in weight and resistant to water and oil. It can be molded to fit contours of almost any product and its base materials can be modified to produce surface variations that range from a rough gray to a smooth, good-looking, white finish. Pulp also can be dyed, brushed or sprayed after fabrication for brand identity or point-of-purchase appeal. Lettering and trademark may be embossed or debossed at time of molding, and finished containers are sometimes lacquered for high gloss.

Industrial applications for electrical parts and units as well as for a hard-to-ship fire extinguisher have pointed up molded pulp's several advantages as an interior packaging material. It can be specially molded to conform to the contours of irregular or complicated products which need a fairly high degree of protection during shipment; it is low in cost and can reduce the labor involved in assembling packages because it readily lends itself to efficient packing methods. It can save shipping cost because of its light weight and compactness which often reduces shipper size. It can be designed to gently cradle delicate parts, and it will not scratch or scuff; it also is proving very effective in preventing damage from impact shock. For added protection against impact, pulp can be ribbed or posted for extra strength at vital points.

Another development, a convenience pack for charcoal, illustrates the ability of molded pulp to be attractively and cleverly designed for both point-of-sale appeal and functional value. It also suggests new possibilities of molded pulp for engineering a package to a specific end use. The charcoal package is constructed to permit lighting without opening—a match is applied to the bottom of the pack and air flows through vent channels molded into the container base and moves up through the chimney, spreading flames to ignite the briquets evenly.

A development in the food field permits rapid, easy and low-cost prepackaging of fresh produce. A green molded-pulp tray with one end of a cellophane strip attached to the bottom is on the market. When the tray is filled, the cellophane is flipped over the produce and heat sealed.

A molded-pulp tray for packaging poultry at the terminal point is another application. The molded pulp is treated with chemicals so that it can retain its rigidity in water and thus withstand icing.

Molded pulp has long been used in this country as a cellular package or cushioning tray for products such as eggs and fruits, while molded-pulp trays have been standard equipment in delicatessens, dairies and bakeries for unit packaging. With the growth of supermarkets and self service, molded-pulp trays have found wide use for pre-packaging meats. Molded pulp has also been successfully utilized to ship growing plants, Christmas tree bulbs and other glassware.

In novelty shapes—some of them clearly seasonal applications such as Easter bunnies and Christmas Santas—molded-pulp forms made by the blown method are used to package candy and certain dry merchandise. The suction method is used for the mass production of egg containers, pie plates and shallow trays.

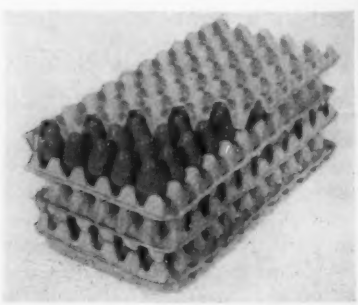
In Europe, molded pulp is found in applications requiring greater strength, achieved by impregnating the pulp with resin. In this country, reinforced pulp which incorporates sisal or other fibres is being utilized for industrial applications, and further modifications are constantly being investigated. If developments continue at the same pace, the future will see many more packaging problems solved with pulp, for both industrial and consumer levels.



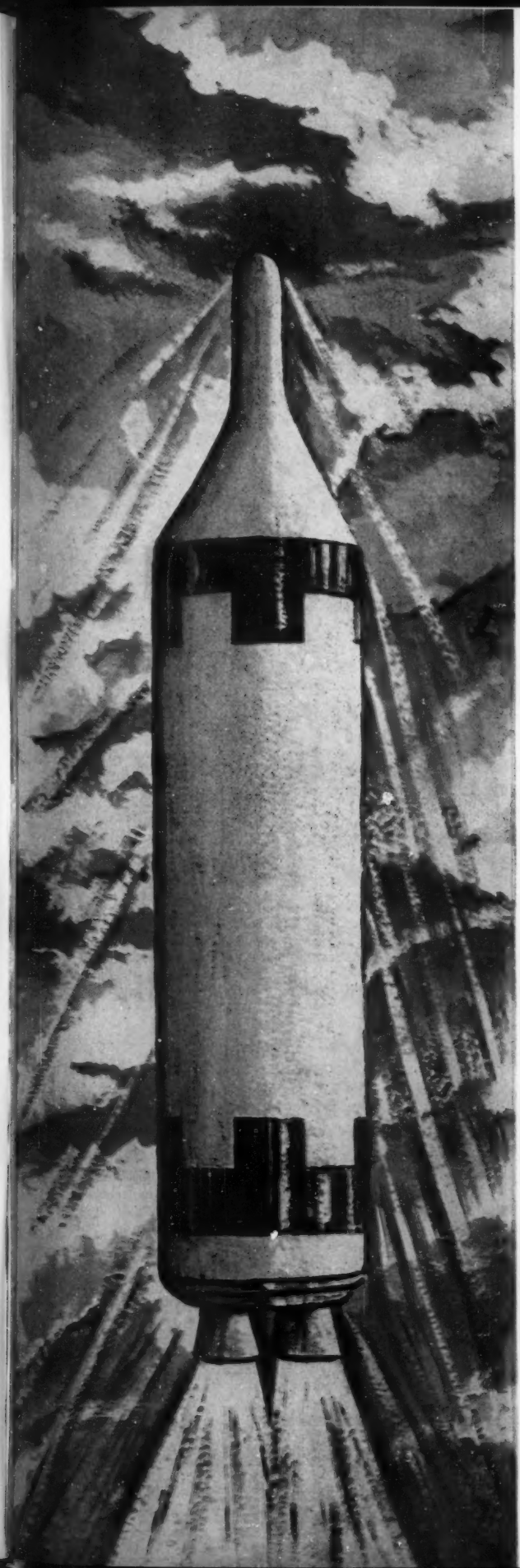
NEW TWO-QUART molded-paper green produce tray provides attractive packaging for fruits and vegetables. (*Keyes Fibre Company tray*)



SPACE-SAVING cradle for liquor bottles conforms to the bottle, eliminates dead space; provides effective protection. (*Diamond National photo*)



AS PRACTICAL as it is protective, tray conforms to odd shape of Christmas lamps. (*Keyes Fibre Company tray*)



In 1866 UPACO first entered the World of Adhesives... TODAY'S "SPACE AGE" FINDS OUR ADHESIVES OUT OF THIS WORLD!

Admittedly, most of our customers have had "Down-to-Earth" adhesive problems over the past 95 years. The "Space Age", however, required a special adhesive in a recording tape for missile use. This challenging problem was solved by a UPACO adhesive! Our Research Department is constantly being called on to produce new adhesives for new purposes.* UPACO is proud of its record in solving these problems. May we be of assistance in your next adhesive problem?

**We make adhesives for almost every known requirement.*

UNION PASTE COMPANY

1605 Hyde Park Avenue — Hyde Park 36, Mass.

DEXTRIN AND RESIN ADHESIVES FOR ALMOST EVERY KNOWN PACKAGING END USE...

REBEL ADHESIVES

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THERMOGRIP®
HOT-MELT ADHESIVES

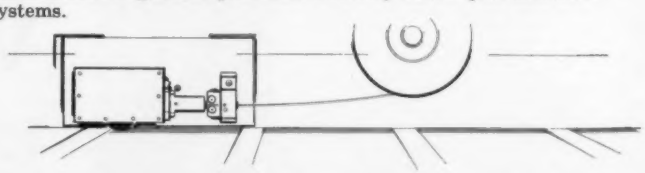
Why are cord-like Hot Melt Adhesives being used by so many now when only a short time ago they were a curiosity?

Answer — Because a modern efficient system for precise control over melt temperature, volume, placement and adhesive quality has been found and developed to a highly usable form.

Unique, cord-like THERMOGRIP adhesives and applicators are shaving applied costs and upping production at many packaging plants.



Lower Applied Costs: THERMOGRIP adhesives lower applied costs by making it possible to seal *more units* in less space, with less adhesive. Daily clean-out that's part of pot type systems is gone for good. This 100% solid, dry thermoplastic adhesive shows production economies through a unique application system that melts, meters and applies THERMOGRIP at greater speed and efficiency than liquid adhesive systems.



A Proven Performer: Millions of packages have been made or sealed by users ranging from makers of multi-wall bags to cartons of many types produced from a variety of materials. Plain, lightly waxed, polycoated, gloss and printed surfaces have been instantly bonded with dots, dashes or bands of THERMOGRIP. Nearly a thousand applicators are in operation.

A Contributor to Better Packaging: Recent accomplishments with THERMOGRIP include replacement of pilfer-prone tuck flaps with firmly-closed but easily opened closures . . . providing heat reactivation for flaps of packages with perishable contents . . . making moisture and vermin-proof seals . . . bonding laminated foil to produce sift-proof packages . . . producing cleaner, squarer packages . . . permitting immediate rough handling — and all at faster processing speeds.



United technical specialists will suggest a specific THERMOGRIP adhesive system (wheel or nozzle type) to fit your precise bonding needs on new or existing equipment. If you make or seal or glue packages, perhaps THERMOGRIP instant setting adhesives can help. Tell us what you want to do. We'll send facts plus reports that tell you how others in similar circumstances have profited. Write "THERMOGRIP Adhesives", United Shoe Machinery Corporation, Department MPE, 784 Memorial Drive, Cambridge 39, Mass.

United
THERMOGRIP®

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SECTION 6

PAPERBOARD PACKAGES

THE VERSATILE FOLDING BOX

by D. A. Forsberg*

Users of folding cartons face two significant trends in carton manufacture—one leading to specialization in traditional markets and the other to creating new containers for merchandising methods yet to be discovered or fully exploited.

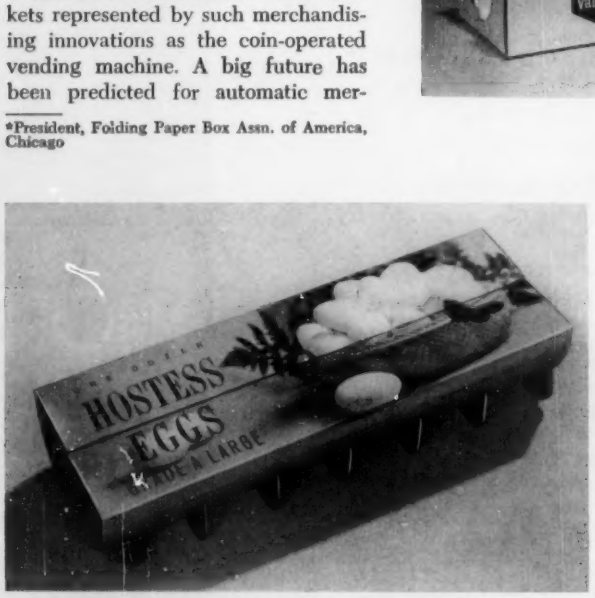
Specialization is an outgrowth of the supermarket system, which has been extended to other type stores, each of which may carry as many as 10,000 different items. Over half of these are newly offered during the course of a year and the packaging job becomes enormous. The folding carton manufacturer often finds it effective to specialize in creating cosmetic packages, for instance, though he seldom limits himself to one type.

The other trend leads to new markets represented by such merchandising innovations as the coin-operated vending machine. A big future has been predicted for automatic merchandising, and folding cartons have already been found to be an ideal container for many of the machines now in existence. Frozen foods, after tremendous growth, still have a long way to go and folding cartons will continue to aid their advance. Recent successful marketing of frozen bread

*President, Folding Paper Box Assn. of America, Chicago



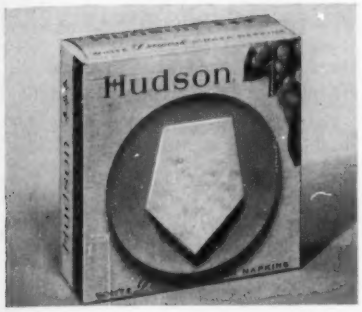
FRAGILE vitamins protected and given merchandising appeal. Slotted trays allow nesting of two units economically within outer container. Display cards serve an extra purpose—as protective dividers. *(Weyerhaeuser Co. carton)*



UPGRADED egg box exemplifies new trend in egg packaging. White patent coated carton is printed in five colors by offset. Fine color photography contributes to the carton's merchandising superiority. *(Continental Can Co., Robert Gair Div., carton)*

IMPROVED ice cream packaging. Container is leakproof, has hinged lid for side opening. Design is printed in four colors by offset, and in one color and varnish by letterpress, on solid bleached sulphate. *(Edwin J. Schoettle carton)*





COLOR PHOTO is accurately reproduced by lithography on carton of 0.021 machine clay-coated newsback. *(Berles carton)*



NEW CARTON for dispensing machine uses 0.012 special stock. Three-color letterpress. *(Richardson Taylor-Globe carton)*

in cartons is an example of growth possibilities in this area.

Consideration of the packaging requirements for products not yet on the drawing boards takes real imagination and it is in this area of problem-solving that the most noticeable, yet intangible, trend is taking place in the folding paper box industry. Yesterday's boxmaker has been replaced by a packaging expert whose loyalty to folding cartons is based on his belief in their inherent versatility and who also is more and more often combining paperboard with other materials to achieve a package as near perfect as possible for the product it will contain. Blisters, foil and glassine laminations, and various coatings and extrusions, are being used more frequently now by folding carton users seeking a particular packaging effect.

The folding carton manufacturer is constantly building more functional properties into the folding paper box. These include mold inhibitors, rust-resistant agents, anti-oxidants, insect repellents and sterilizing qualities.

Background

Invented through a printer's error in 1879, the folding paper box is so much a part of American culture and everyday life that it is taken for granted like electricity or running water. The first folding cartons were crudely printed on existing common board. Today high-grade boxboards are being used for all kinds of products, and multicolor printing is being employed for merchandising effectiveness. Shifts in board grades used in folding paper box converting operations continue to favor solid bleached sulphate board, used primarily for food containers but now increasingly specified for other products as well. Use of this grade increased 19.2% from 1959 to 1960 alone, although patent coated boxboard is still the largest high-grade stock for folding boxes.

Other significant growth patterns in the industry have been advances in the cosmetics, food, candy, hardware, sporting goods and toys, textiles and paper goods end-use classifications. Upgrading is especially evident in frozen food and cake mix packages where visibility of the product is not essential and lifelike illustrations are used extensively for sales appeal. These mouth-watering photographs are reproduced authentically as a result of great pains and skill on the part of the plate maker and the printer. Four printing processes are used in carton plants. Each has its advantages and its limitations. (See articles and chart on printing in Section 15.) Letterpress has long been the standard method, but there is an increasing shift to offset and gravure to achieve desired reproductions.

While carton printing is constantly being improved, it is in the construction of the carton where the greatest degree of ingenuity comes into play. The making of dies to be used for the cutting and creasing of boxboards to create folding cartons is an art that is used to produce boxes in unlimited styles, shapes and sizes.

Cutting and creasing is performed on a platen or cylinder press similar to a one-color printing press, except that the inking mechanism has been eliminated and a steel rule die, rather than a printing plate, has been mounted on the bed of the press.

The die is an intricate jigsaw-puzzle arrangement of tempered hard-steel rules held apart by small blocks of wood. Some of these rules are sharpened to cut through the sheet of board, while others are designed to make only a crease.

In an otherwise highly mechanized industry, much of the die maker's exacting work must be done by hand. Tolerances are measured to 1/1000th of an inch and the last carton in a run of 1,000 or 1,000,000 must be the same as the first.

Other major operations in the manufacture of folding paper boxes are stripping away the waste or excess board surrounding the carton blanks and the gluing together of certain parts of the carton. After stripping, many styles of folding boxes are then ready for delivery to the customer. Other styles, however, require gluing —either along a glue lap in the case of a tube construction, or at the corners in the case of a tray.

There are two basic styles of folding cartons—tubes and trays. The former is a sheet of paperboard folded over and then glued along an edge to form a rectangular tube. The ends can be sealed or locked in a variety of ways. A tray is a sheet of board with its sides folded at right angles and locked, glued or stitched together at the corners. One panel can be extended to form a cover, or two trays can be fitted together to form the top and bottom of a complete box. From these two primary concepts has evolved the entire gamut of styles regularly produced today.

Folding boxboard may be fashioned into literally hundreds, if not thousands, of different structural styles of single and multi-unit folding boxes, containers and displays. Some common styles are:

1. One-piece tubes with either seal or tuck ends
2. One-piece trays, with or without integral covers, in Brightwood and



FASHION ELEGANCE achieved by multicolor letterpress on simple carton of lustrous white board. *(Warner Bros. carton)*



IMAGINATIVE hat box employs novel construction and invites carry-home. White, gray liner. *(Federal Paper Board carton)*

diagonal-fold styles. (Brightwood is a tray-style carton with glued ends, named for the inventor of the machine first used to produce this style)

3. Telescoped trays forming separate bottoms and tops or covers

4. Display containers, which are adaptations of the above basic styles, formed into easeled, tilting or tiered boxes

5. Folders, tube and slide units, and mailers

6. Dispensing boxes for products in which the entire contents of the original package are not used at one time and the balance must be protected or made readily available

7. Carriers, for bottles and cans, made in a wide variety of shapes and sizes, many of which are covered by patents on the carriers or the machinery on which they are used.

The folding carton is probably nearest to the universal unit package. The attractiveness of most consumer items can be enhanced by well-designed cartons. This is significant, for self-service has spread from food stores to drug, hardware and department stores and is widely practiced.

A breakdown of folding-carton volume indicates the diversity of its use in merchandising. About 38% of the production goes to package food products such as cereal, crackers, candy, flour, fresh meats, butter, fruits and vegetables. Drugs and cosmetics account for about 7%; bottled and canned beverages, 9%; hardware, 5% and soap, about 11%. Another 25% packages a myriad of other items, including tobacco, textiles, sporting goods and toys.

Most boxes are manufactured on special order to meet the customer's specifications, but about 5% of them are so-called stock boxes or retail cartons. They are made up in large quantities in standard sizes and styles and sold in small lots to retailers whose individual needs do not justify a special order. They can be produced in attractive styles and carry the imprint of the individual merchant.

Folding cartons are manufactured by 600 plants in 39 states. There is no industrial center from Maine to California that does not have ready access to an adequate supply of folding cartons. Industry shipments of folding paper boxes in 1960 totaled $940 million, a decline of 0.5%, or $4 million under the all-time high of $944 million reached in 1959. The 2,313,000 tons shipped during the year were some 54,000 tons less than the 2,367,000 tons in 1959, but just about equal to the 2,313,500 tons shipped in 1958.

Cartons averaged a value of $406 a ton in 1960. Annual shipments were broken down into the following board grades: patent-coated, 31.2%; bleached manila, 17.5%; bending chip, 12.3%; clay-coated, 11.2%; solid bleached sulphate, 10.5%; laminated, 7.0%; unclassified, 6.5%; and kraft, 3 8%.

There are many special types and grades of folding boxboard. (See article and chart on boxboards in Section 3.) In addition, each paperboard mill produces special trademarked boards of its own, marketed under the mill's own brand name. In recent years, there has been rapid growth in this kind of production.

Because of the upgrading of printing quality, with more and more printed board going to high-quality halftone printing, there has been a substantial growth in coated boxboard.

The sanitary properties of solid board made from virgin materials originally caused it to be used for packaging wet foods; but this kind of board is now used for many other products because of its better performance and appearance qualities.

The folding carton has four basic jobs: *protection, shipment, sale of the product* and *user advantages*. To obtain the best possible carton that will perform these duties effectively and economically, the packager and his supplier must work together. For this the box manufacturer must know:

1. The exact size and physical characteristics of the product

2. What kind of package will be most practical and economical

3. Whether the product manufacturer will fill the carton mechanically, by hand, or by a combination of both

4. How, when, where and in what quantities the product will be sold.

A complete list would be quite long, and in this connection the reader should consult the article, "Planning Your Package," p. 26.

How to buy a box

When placing an order for folding cartons, the buyer always should give his supplier complete specifications. Reliable folding carton manufacturers not only are anxious to produce exactly what the customer wants but also they are in a position to give valuable advice about the kind of package that would be most suitable for his product and the best way to get the product into the carton—manually or by automatic filling machines. In writing the specifications, the wise buyer takes advantage of the supplier's wide experience. In many cases design services can be provided or an evaluation made of the carton's market potential. Much guesswork, possible embarrassment and extra cost will be avoided if no work is begun until the following detailed information is provided in writing:

1. *Name of product.* This should identify the box completely—eliminating any possible confusion with others of the same line.

2. *Size of box.* Dimensions of cartons always should be specified in sequence of length, width and depth and all measurements should be made from center of score to center of score or edge of blank. Length is always the larger dimension at the opening, width the smaller dimension at the opening, and depth the remaining dimension.

3. *Type of paperboard.* The exact grade of paperboard desired should be specified.

4. *Caliper.* The thickness of folding boxboard, expressed in 1,000th of an inch units.

5. *Style.* Many carton styles are available and your carton supplier will be able to advise you.

6. *Method of packaging.* Hand fill or the make and type of automatic or semi-automatic filling machinery should be specified.

7. *Copy and proof.* The copy and typography should be presented exactly as desired and with detailed instructions for setting type. In the case of illustrations, the folding carton

manufacturer should be consulted. Proofs on actual board samples are highly desirable.

8. *Engravings.* Engraving costs may or may not be included in quoted prices of boxes. Special instructions should be given in advance.

9. *Printing.* Letterpress, offset lithography, flexography, gravure or screen process. (See also articles and checklist regarding printing in Section 15.)

10. *Colors.* Specific hues and shades and allowed tolerances from approved standard should be indicated.

11. *Additional operations.* The manufacturer must know in advance if the boxes are to be varnished, waxed or otherwise treated. If a cut-out is to be included, its exact specifications should be stated. If the box is to have a window, the desired type and thickness of the transparent film must be noted. If other functional properties are required they should be specified.

12. *Packing.* Such instructions are to include kind, maximum weight of shipping container, number of cartons per case, and the method of marking to facilitate inventory control and handling.

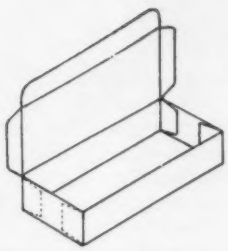
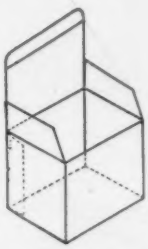
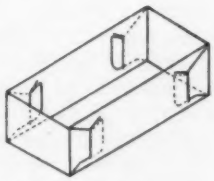
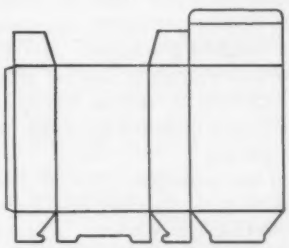
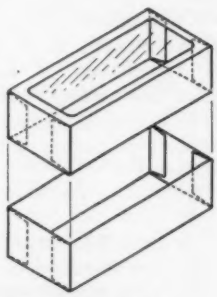
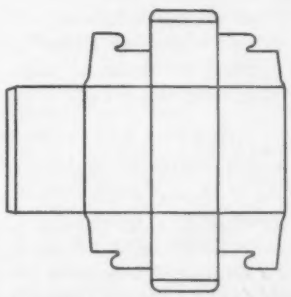
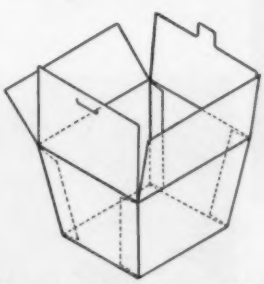
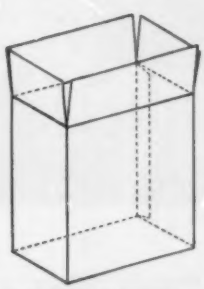
13. *Delivery.* Date, routing, destination and any special shipping instructions should be decided in advance.

More a service than a product, today's folding carton is composed of all the ideas and ingenuity developed through the years. It is a convenient container, a guardian against spoilage, waste and deterioration, a constant advertisement and a compelling point-of-purchase salesman.

Business and consumers continue to accept overwhelmingly the folding carton because it protects and assures the uniform quality of the product. Producers of branded products know high standards are a must to keep public confidence. Brand names printed on the carton guarantee the consumer quality contents and protection against substitutes. The name on the box tells people what to expect.

The folding carton also assures an honest measure and is a testimonial of cleanliness were sanitation is a must factor.

An outstanding factor is the economy of the folding box. Producers of consumer goods are benefited by a package of great convenience fulfilling their most exacting requirements at low unit cost. Since the folding carton is sent flat, or knocked-down, it is economical to ship and store.

TYPICAL TRAY STYLES	TYPICAL TUBE STYLES
 GLUED-CORNER TRAY WITH TUCK COVER	 TUCK-END CONSTRUCTION WITH ONE END CLOSED
 LOCK-CORNER TRAY	 LOCK-BOTTOM CONSTRUCTION (FLAT BLANK)
 TWO-PIECE TRAY WITH TRANSPARENT WINDOW	 COMBINATION TUCK-END AND LOCK-END CLOSURE (FLAT BLANK)
 GLUED-CORNER TAPERED TRAY WITH LOCKING TOP FLAPS	 SEAL-END CARTON WITH ONE END CLOSED

DRAWINGS COURTESY NEW HAVEN BOARD & CARTON CO.

Successful packaging with set-up boxes

by Wallace Ungemach*

The set-up paper box is a rigid container produced and delivered in three-dimensional construction ready to be packed with merchandise. As a container it is a very old form of package, but its use in packaging today centers around advanced ideas in upgrading, displaying and merchandising packaged products. Despite the fact that it offers so much in the way of detail in both appearance and construction the set-up box is a singularly uncomplicated form to manufacture. It does not require expensive dies or massive machinery. Also the processes employed in making boxes lend themselves to variety, craftsmanship and easy adjustability from one run to another.

From the packager's point of view, this means great freedom in planning and selecting the package. The design can be individualized readily to fit the product. Appropriativeness is an increasingly important concept in packaging-merchandising strategy and the set-up box excels in giving a product an environment that will help it put its best sales foot forward. Moreover, the packager has almost complete freedom to choose a range of shapes and sizes. Runs can be small, medium or large and volume can fluctuate without occasioning excessive economic penalties. The set-up box can accommodate unusual requirements in regard to windows, domes, embossing, platforms, hinges, lids, compartments and the like. This versatility is extremely valuable, of course, in meeting many of today's important demands for both merchandising and convenience.

The set-up box deserves consideration if your packaging strategy calls for special emphasis on beauty or dramatic display. It is no accident that set-up boxes are so widely and successfully employed in merchandising jewelry, cosmetics and fine candies. There are lessons to be learned from the fact that, in product lines where selling arts have been assiduously cultivated for a long time, the set-up box has continually been one of the favored package forms.

Indeed, because this container has been so often associated with tasteful, luxurious and gift-type packaging, there may be a tendency for some packagers to overlook some of its very practical advantages. In an era that acclaims convenience, it should be noted that the set-up box is extremely functional—it provides a superior type of protection; it lends itself to orderly arrangement (and use) of sets or multiples; it is easy to open and close; it excels in stacking, handling and display characteristics; and it is a very good use and re-use package. Also, because it is generally used in the company of quality products, it is a package that consumers accord prestige and ready acceptance. For example, a recent survey conducted at a suburban shopping center showed that 85% of the shoppers questioned said they preferred set-up boxes to alternate types of packaging.[1]

The packager may want to investigate the potential advantages of having the box manufacturer be his contract packager. Sometimes it may be more practical to ship the product to be packaged to the box maker than to ship the boxes to the product manufacturer. If so, much extra handling may be eliminated, for the box maker can fill the set-up box as it comes from the box-making machine and then close it and pack it for shipment.

Origin and progress

The set-up box dates far back in history. Pasteboard was introduced in the Sixteenth Century and this led

*President, Wallace Paper Box Corp., Maspeth, Long Island, N. Y.

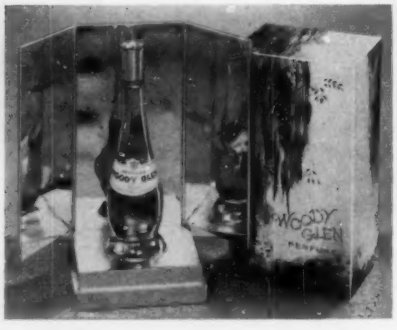
1See "What Shoppers Want," MODERN PACKAGING, July, 1960, p. 110.

GIFT APPEAL to girls. Toiletries package has removable platforms which add value as re-use box for trinkets. Decorations are white, pink, gold on sturdy box with sleeve cover, cut-out window. (*Wallace Paper Box Corp. box*)



SALES IMPACT for popular gift set provided by a pin-hinge cover to elevate the base for display and by rich gold-foil wrap printed in white leaf. Platform, lined with white satin, is punched to hold the items firmly. (*Dennison Mfg. Co. photo*)

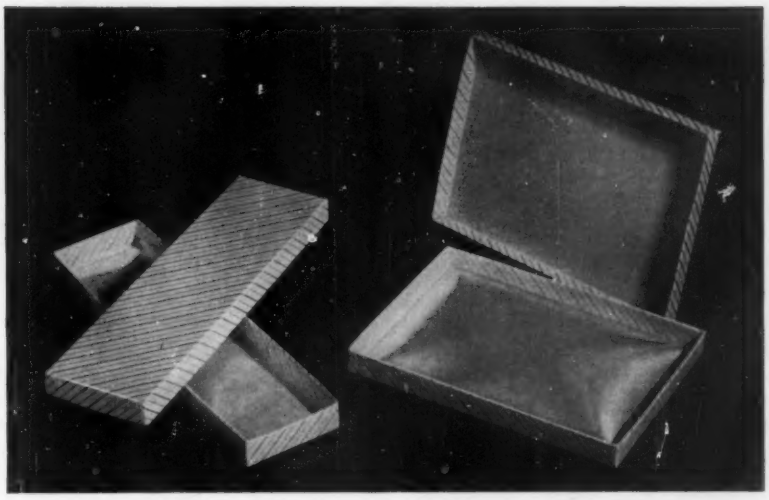




ARTISTRY INSIDE as well as outside. Hinged copper mirrors open for three-way reflection. Snug-fitting recess in box holds base of bottle; die-cut tray slips over neck, immobilizes it in shipment. (*Shoup-Owens box*)



PILL BOX for drug trade features ease in opening, reclosing, filling. Its shape provides easy storing. Printed pharmacy label applied on top. (*E. N. Rowell Co. photo*)



CONVENIENCE and simplicity typified by boxes for jewelry. Covering is silver-striped white paper. Rayon covers padded bottom. (*Lebanon Paper Box Co. photo*)

to the manufacture of set-up boxes. In following centuries, the art of box making flourished. Museums the world over contain fine examples of these beautiful boxes. In this country Colonel Andrew Dennison made the first set-up boxes in 1844.

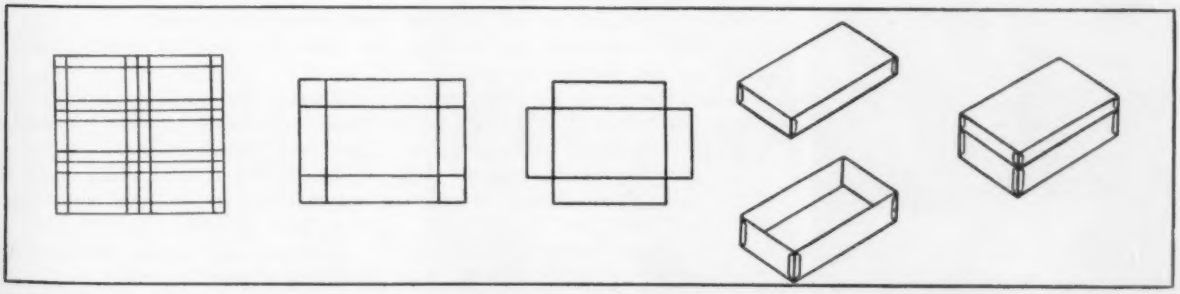
Quite recently set-up box making has undergone much change. In fact, there probably have been more machinery advances in the past 15 years than there were during the 50 years that preceded them. Operations of staying, wrapping and lidding are being handled on automatic machines. Quality and economy both have increased. Board stocks have been improved. The introduction of thermoplastic adhesives made in-line production practicable and also eliminated the problem of adverse effects that atmospheric changes once had on box production. Currently, the marriage of set-up paper boxes with newer materials and methods—transparent plastics, thermoforms, plastic foams and polyethylene-coated papers—is providing the packager with a much more sophisticated and strategic opportunity to make effective use of this container.

Set-up boxes are made from four basic materials: boxboard, corner stays, adhesive and covering material. First, flat sheets of boxboard are cut and scored to size. Individual blanks are separated from the sheet and the corners are cut out. Second, the sides of the blank are folded at right angles to the base to form the sides of a tray. Third, the corners of the tray are stayed (sealed and reinforced) by adhering paper, cloth or metal reinforcements to the corners. It is this process that gives the box its exceptional strength. Fourth, the decorative covering (wrapper) is adhered to the box.

Thus the basic form is constructed. Choice of board stock determines the strength and rigidity. (See "Boxboards Used in Packaging," p. 93.) Variations in shape and physical dimensions are obtained by adjusting the slitting and scoring of the sheet stock. Shapes commonly produced include cubes, pyramids, cylinders and cones. Special shapes such as hearts, stars, boats and the like can be obtained, for variations on the basic constructions will produce an infinite range of constructions and designs.

The box can be (1) a single unit or (2) a base and a cover, or (3) it can be made up in multiple or mixed components. The base unit can have a flat lid, box lid, died-out opening, plastic window, a transparent lid or similar variations. The covers can be free hinged, telescoping, slide-on and the like. Shoulders, lips, extension edges, domes, ridges and special panel effects can be obtained. The interior of the box can be fitted with partitions, platforms, inner trays or special linings.

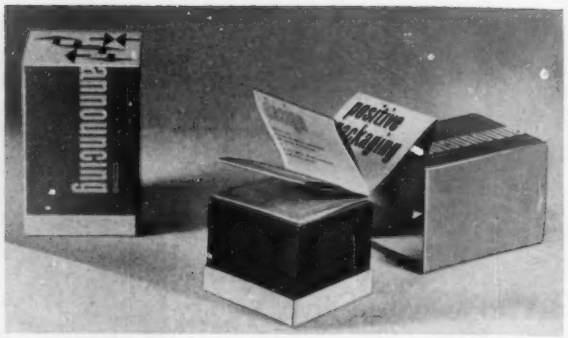
Coverings or wraps are selected from a very wide range of fancy papers (see p. 86) which provide virtually every protective and decorative effect that the designer or packager could possibly wish to use. Obviously this latitude in choosing constructions, materials and functional characteristics



BASIC STEPS in producing a set-up box. Sheets of boxboard are scored and cut to size. Individual blanks are broken from sheet and corners cut. Sometimes intricate designs are "died out." Box shape is formed and corners are stayed. Lid is similarly processed. Fancy wraps, platforms or other special effects may be added. *(Diagrams courtesy National Paper Box Manufacturers Assn.)*



TELESCOPE box for presentation of medicines to doctors has solid two-piece construction for safe mailing. Thumb cuts in lid make easy opening after glued lid flaps are cut from base. Samples anchored in die-cut platform insert. (*Walter P. Miller box*)



PROMOTIONAL package incorporates unusual features. A message is on a cardboard series of folds fastened to the neck-style base with tall shoulders. The folds open when the lid is removed, and disappear when it is closed. (*Warner Brothers Co. box*)



COMBINATION of paperboard trays and transparent acetate body packages two jars of cosmetics. Foamed styrene pads in base and lid cushion and protect units, separated with a disk.. (*Samuel Barnett Co. box*)



CONSERVATIVE motif of bottle repeated in box. Exterior resembles gray pin-striped cloth, with black and gold trim. Base holds bottle snugly. (*F. N. Burt Co. box*)

places great responsibility on the designer and the packager to make wise use of their choice.

Industry profile and practices

Box making lends itself to regional operations and also to specialization in the types of boxes produced and industries served. There are about 700 set-up box manufacturers in the United States. Many of these are small companies, but most of them employ 50 or more employees and some combine the manufacturing of other forms of packaging with set-up box making. Total annual sales volume for the industry is in excess of $300 million. Some 14 product categories are the major users of set-up boxes. Of these, the largest user is textiles and wearing apparel. Confections, jewelry, hardware, leather goods, toys, cosmetics and pharmaceuticals are also among the users of set-up boxes in large volume.

It is standard practice in ordering set-up boxes to give dimensions in the following order: (1) length, (2) width, (3) depth. Measurements are based on inside dimensions (score measure) only. Measurements of the base normally control the dimensions of the lid.

Board is bought by the ton, but the number of standard size sheets of board per ton can vary tremendously. Standard size sheets are 26 by 38 or 25 by 40 inches. The strength and quality of the board are among the important considerations in specifying board stock. These characteristics are known as "basis" and "finish."

Basis is the number of sheets of standard size 26 by 38 (988 sq. in.) or 25 by 40 (1,000 sq. in.) in a standard bundle weighing 50 lbs. Thus 120 sheets weighing 0.42 lb. per sheet make a 50-lb bundle of 120 basis board.

Finish is the smoothness of the board regulated by the pressure exerted on the calenders under which the board passes during manufacture. Finish basically refers to density. For example a standard sheet of 50 basis board weighs one lb. per sheet, but it can caliper 0.36 to 0.52 inches depending on density or finish. A sheet compressed to 0.36 in. is, of course, stronger and smoother than a 1-lb. sheet that is 0.52 in. thick.There are four designations for standard finish in the set-up box field, and they are as follows:

No. 1 rough dry, a low-density, rough-surface stock that gives the greatest number of sheets for its weight.

No. 2 medium water, a stock that is popular for ordinary printing and general utility.

No. 3 smooth water, used where better printing surface is required.

No. 4 very smooth, a stock with slick surface and firmly compacted fibre. Yields fewest number of sheets per 50-lb. bundle.

Terminology

Terms commonly used in referring to set-up boxes include:

Base–The lower or receptacle portion of a set-up box.

Dividers–Loose strips of paper or boxboard used to separate commodities placed side by side.

Dutch top–Lid in which padded top is slightly less in length and width than lid, which is set up with shell.

Flap lid–Lid having no sides or ends and hinged to base.

French lid–Lid with extension edge and with sides and ends of lesser height than sides and ends of base,

and fitting outside of sides and ends of base.

Lid—The upper or covering portion of a paper box.

Lifts—Pieces of ribbon, cloth, tape or paper attached to trays for convenience in removing trays from base.

Loose wrapping—Process of covering lid with paper on wrapping machine or by hand, wrappers being in one piece and having adhesive at edges only.

Neck—A shell inserted in base of shoulder box, attached by adhesive, and extending above the base into the lid when box is closed.

Padded top—Extra top, covered with paper or cloth and having one or more layers of wadding or other padding material, and attached to top of lid.

Partitions (loose)—Slotted pieces of boxboard fitted together to form a series of compartments, and placed in base without being attached thereto.

Partitions (solid)—Any construction of boxboard or other material attached to interior of base and forming subdivisions therein.

Pulls—Metal handles or pieces of tape or ribbon attached to base of shelf or file boxes for convenience in removing shelves.

Scoring—Making knife cut on boxboard (score marks) for purpose of forming bending line; feeding sheets of boxboard through scoring machine.

Shoulder box—Box having glued neck so inserted that ends and sides of base form shoulder upon which lid rests.

Slide box—Box in which lid is in shell form and into which base is inserted at side or end.

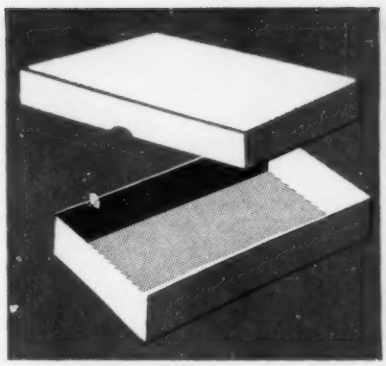
Stay—Material used for reinforcing corners of base, lid or tray. This may be paper stay, cloth stay, combination stay (combination of cloth and paper), wire stay, or metal stay.

Telescope box—A box in which the sides and ends of lid slip over the base either partial or full depth. The standard box for fancy chocolates is a good example.

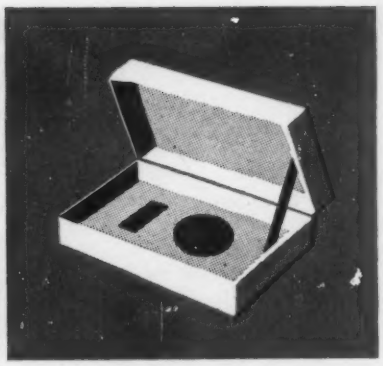
Tight wrapping—Process of covering base, lid or tray with paper on wrapping machine,or by hand, wraps being in one piece and having entire surface covered with adhesive.

Tray—A receptacle for which no lid is made.

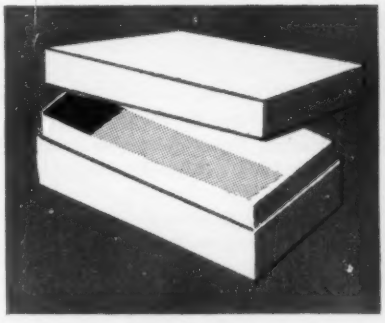
Trim—Paper or cloth used to strengthen or form decorative covering for the edges of base, lid or extension edges.



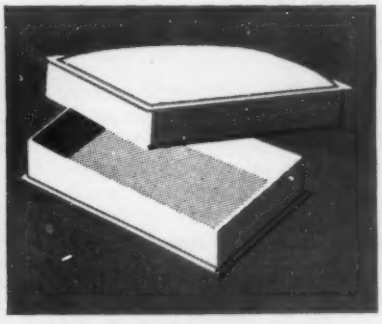
Full telescope



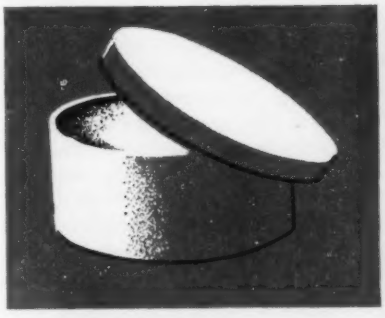
Hinged cover



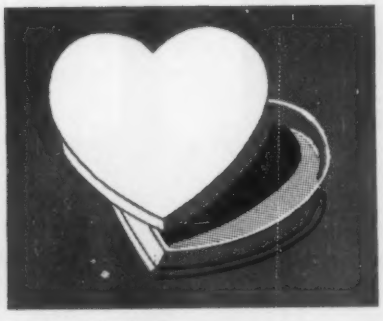
Shoulder style



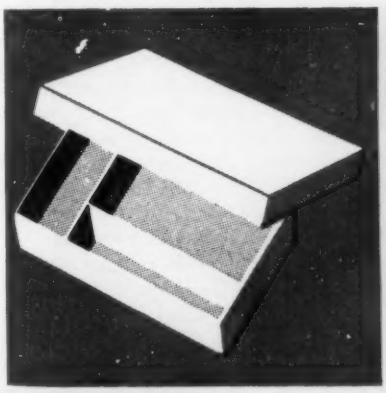
Extension edge



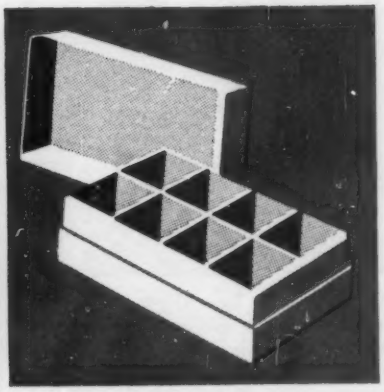
Round and oval



Special shape



Interior platform



Slotted partitions

Paper cans and tubes

by Paul W. Stump*

There are two classifications of paper cans—or fibre cans, as they are more generally known in the industry. One is the conventional design and the other is the more distinctive tailored-to-order type.

The conventional design is made up of the basic types of cans which have been considered standard for a number of years, compared with those of novel design which are tailored to particular products or to the convenience of the consumer.

Conventional or basic cans. Of the basic type cans, the lowest priced cylindrical container is the all-paper can which is used, for example, in very large quantities for packaging table salt. The body of this can is made of a spirally wound tube, usually of commercial-grade chipboard. The top and bottom are formed from a paper known as capstock and glued to the ends of the tube, thus completing the can proper. They are usually furnished with dispensing plugs or pouring spouts.

Optional features for added protection include moisture-resistant barriers which can be supplied by linings of paraffin, glassine, parchment or anticorrosive papers. The cans may be furnished with continuous, printed wraps spiraled on or with labels applied by either the manufacturer or the packer. One side of the capstock ends can be in a color that blends with the label.

Composite fibre cans. Probably the most widely used of the paper cans is the composite type which has a fibre body and metal ends. The bottom is of tinplate, seamed to the side wall of the container. The top may be a metal slipcover, or a metal ring seamed to the side wall with a closing plug that fits tightly into the ring. The latter is known as the friction-plug type of can.

There are numerous uses for this can in the packaging of dry products such as chemicals, moth crystals, spices, baking powder, etc. The use of metal at both ends of the container adds strength to the side wall, resulting in a rigid package which may be re-used many times.

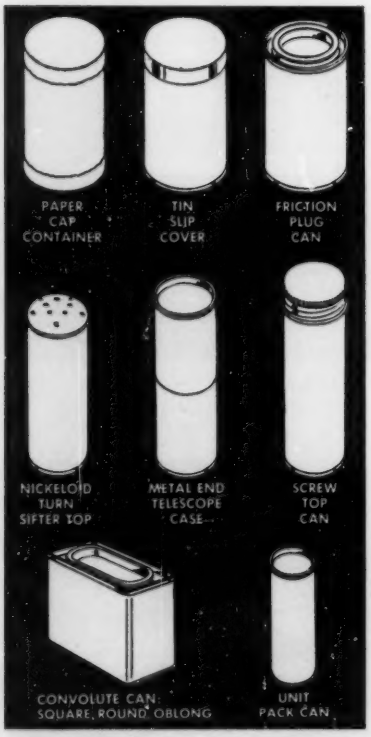
This container provides a good package for hygroscopic or oil-base chemicals and similar products when moisture- or grease-resistant barriers are used. These barriers include glassine, parchment, aluminum foil, cellulose acetate and polyethylene. Labels to customer specifications can be applied either by the manufacturer or by the packer. In addition there can be direct printing on the container or a continuous, printed wrap spirally wound on the outside. Metal ends may be embossed and furnished in colors using lacquer or baked enamel.

A similar type of can has a turn-sifter top which is made with a revolving perforated metal closure. These closures are made with a metal under-top and fitted tinplate or nickel turn-sifter top. The body of this container is usually of chipboard with a tinplate bottom seamed to the side wall. Where the quantity warrants, seaming machines are available to the packer under a lease arrangement for the closing operation. The tops are made with up to 12 perforations.

Liners of moisture- and grease-resistant barriers can be furnished to meet the particular requirement of the product packaged. Labels may be applied as with other basic types of cans. A spot label may be applied in some instances. The turn sifter is used to close cans for many products such as insecticides, talcum powders, grated cheese, bread crumbs, etc.

Metal-end telescope cans. Another can of basic design is the metal-end telescope case. This is usually of three-piece construction made up of a full-length, inner sleeve over which are assembled two outer tubes having metal ends. The telescope case is also made of two-piece construction consisting of two close-fitting tubes having metal ends with one tube fitted over the other.

*Packaging Engineer, The Cleveland Container Co., Cleveland, Ohio.



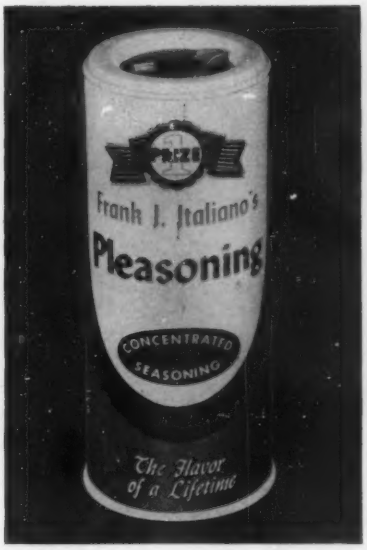
BASIC TYPES. These all-paper and metal-end cans permit a wide choice of diameters, heights and dispensing fitments to meet many practical requirements for protection, merchandising effectiveness and ease of use. ***(Cleveland Container Co. drawings)***



METAL-END fibre can for chessmen saved packaging costs; it eliminated former die-cut inserts for placement of items. Prevents pilferage, occupies less space, provides home storage. ***(Sefton Fibre Can photo)***



MODERN FIBRE CANS are adapted to many practical uses. The diversified products packaged in them range from different types of cosmetics to pet food. The variations in shapes and sizes add to their merchandising appeal. *(Niemand Bros. photo)*



SEASONING can has plastic top, rotating to sprinkle, pour, measure, seal positions. *(Cleveland Container Co. photo)*

Another variation of the telescope container is the type with curled and disked ends. It is all paper, the ends curled and fitted with paper disks.

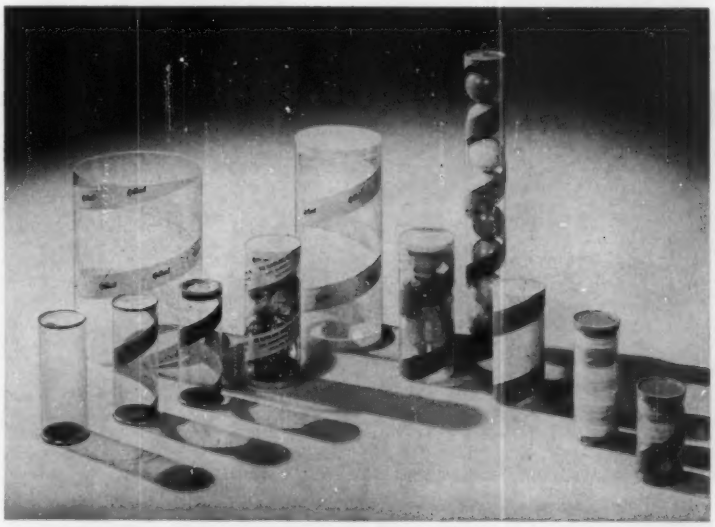
The telescope case is used to package a large variety of items, such as small tools and automotive parts, and is used extensively for mailing. The top of this can is easily removed and replaced, making the container reusable any number of times. Another variation is one that is used as a dust gun for spraying insecticides.

Many of these containers are made to Government specifications for the packaging of ammunition. In addition to the usual liners for moisture and grease resistance, this container can be lined with VCI (vapor corrosion inhibitor) paper that provides a corrosionproof package, particularly suitable in the packaging of expensive metal parts. In addition, this container can be labeled in the usual manner or it can have decorative or preprinted paper spirally wound on the case surface.

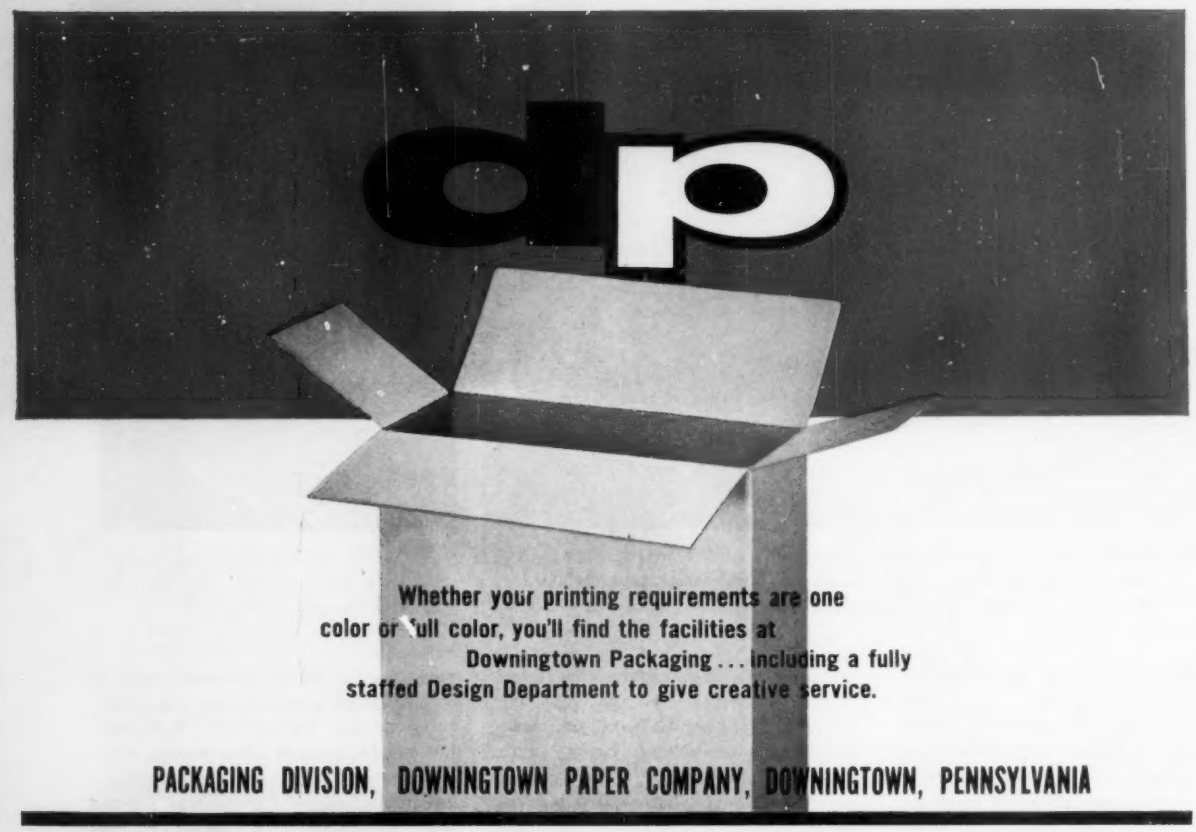
Screw top cans. The screw top can also has a removable top and is made with a metal threaded ring seamed to the top of the can on which the metal threaded cap is fitted. The bottom is metal seamed onto a fibre body, usually of chipboard. These cans are generally used as mailing containers and comply with all postal regulations. In addition, they can be used for the packaging of fishing rods, toys, repair kits and instruments. Various protective barriers and decorative effects can be specified.

Unit pack can. The unit pack can provides a continuous barrier with both the metal bottom and top seamed on. This container is not made for re-use and, for this reason, the top has to be seamed on at the time of filling. It has more application for long production runs and where maximum protection is required.

The unit pack can is used for a great variety of products ranging all the way from spark plugs to refrigerated biscuits. The side wall or body of the can, as in the previous types, is composed of a spirally wound paper tube usually containing chipboard; but can be made of other papers, such as kraft and laminated combinations. Very often there is a layer of foil or some other barrier such as glassine or duplex kraft which provides a moistureproof and greaseproof package. Corrosion inhibiting paper is also used quite often where a rust preventive is required. This container may be labeled to customer specification or, depending on the size, may be printed direct or have decorative



TRANSPARENT CONTAINERS, a newer packaging development, are ideal for merchandising products that have natural eye appeal. *(Cleveland Container Co. photo)*



papers spirally wound on the surface.

Convolute cans. Completing the list of basic cans is the convolute labeled type of can, although it is somewhat different in construction. A good example is the rectangular can used for packaging cocoa.

Convolute cans are available in round, square and oblong shapes. They have two advantages: first, the label can be applied at the same time the body of the can is formed; and second, their square or rectangular shapes utilize shelf space to better advantage than does a round can. The bottom is of metal crimped to the fibre body and the top can be almost any type of closure, but the common rectangular shape is usually fitted with a metal ring and friction-plug top.

A point of interest in the manufacture of the fibre body of a convolute can is that the mandrel, over which the plies of paper are wound, rotates. In the spiral type, the mandrel remains stationary. The plies feeding over the mandrel in the spiral type are bound together under the pressure of a continuous belt.

Novel designs

This group of containers embracing more novel or distinctive features of



EASY-OPENING is provided for this paper can by newly developed tabbed tear strip of aluminum, which completely seals and protects product. Smooth edge insures a snug fit when top is replaced. *(Cleveland Container Co. photo)*



MULTI-LAYER can for frozen fruit juices offers strength, economy. Container consists of aluminum foil liner, two plies of kraft fibre, an outer layer of aluminum foil serving as label. Insulating quality prevents quick thawing. *(R. C. Can Co. photo)*



WHICH ONE COMES FROM FIBREBOARD?

Which carton was created by a team of beverage specialists — including designers and draftsmen, salesmen and scientists? Which carton comes from the company where every major industry is covered the same, sensible way: by teams of experts in that specific field? Which carton, in short, comes from Fibreboard? Your customers can pick it out—and do.

The carton from Fibreboard is Fibresix... the brand-new home for beer that offers more display area (in the end panels where it is needed!), ships safer, cuts packaging costs. Shouldn't your cartons come from this kind of company? Write: Fibreboard Paper Products Corporation, 475 Brannan Street, San Francisco. (Also New York, Chicago, Los Angeles, other major cities.)

construction is designed more specifically to package some particular product. One example of this type of design is the cartridge made for dispensing lubricating grease. These containers, spirally wound of better grade paper, have a greaseproof liner with metal ends adapted to the particular requirement. In the case of the caulking compound cartridge, one end is usually fitted with a plastic spout.

This type of container, usually made in quantity, often has the label applied spirally as the tubing is wound over the mandrel. This method is not essentially restricted to this type of container, but is a good example of a trend to spiral labeling.

Transparent cans. This type of container is the most recent development. Its popularity is due principally to the practice of self-service and the need for effective visual display of the contents. One material used for the body of this container is oriented polystyrene which is spirally wound with or without a paper band covering the spiral seam. The band, when used, provides space for identification of the product and other printed matter. The bottoms and tops can be of metal or plastic, with the most recent trend toward a metal bottom and a plastic top. These containers are ideal for packaging any "dry" product with an eye-catching appearance, such as candy and toys.

Plastic closures. One more recent example of novel design is the plastic closure. An illustration is the handy size table salt can that features a two-piece patented plastic closure.

Cans using plastic closures usually have bottoms of metal and tops of plastic or of metal with a plastic sifter wheel. Some of these closures permit three positions: sift, pour and closed. Openings in some closures are large enough to permit the insertion of a measuring spoon. Those made of plastic material turn easily and are available in attractive colors.

Future applications of the fibre can point not only to the adaptability to the product but also to convenience for the consumer. In the last few years the trend has been to make the package conform to the product, but more recently the tendency is to make the package more convenient for the consumer to use. These refinements apply not only to the dispensing closures but also to the size and shape of the container. For some time cans have been made for high-speed filling and generally lend themselves to good rates of production.

Paper tubing

The uses of paper tubing are almost unlimited. One of the most common uses is that of mailing tubes. Another large volume use of paper tubing is that of cores for the winding of plastic films and industrial tapes.

Spiral or convolute wound paper tubing usually is made of chipboard, jute or kraft. The use of convolute tubing is confined principally to the textile industry. Paper tubing can be wax impregnated or lined with special greaseproof and anti-corrosive papers. It also can be furnished with printing direct on the tubing or preprinted papers spiraled on the outside. It is produced in diameters ranging up to 24 in. and with as much as a 1-in. wall thickness.

Tubing is also made of special grades of kraft, impregnated with resins. Tubing can be punched, notched or grooved and furnished with plain, round or flat curled ends. Paper tubing, as in the case of the fibre can, already covers an enormous field and is finding new uses daily.

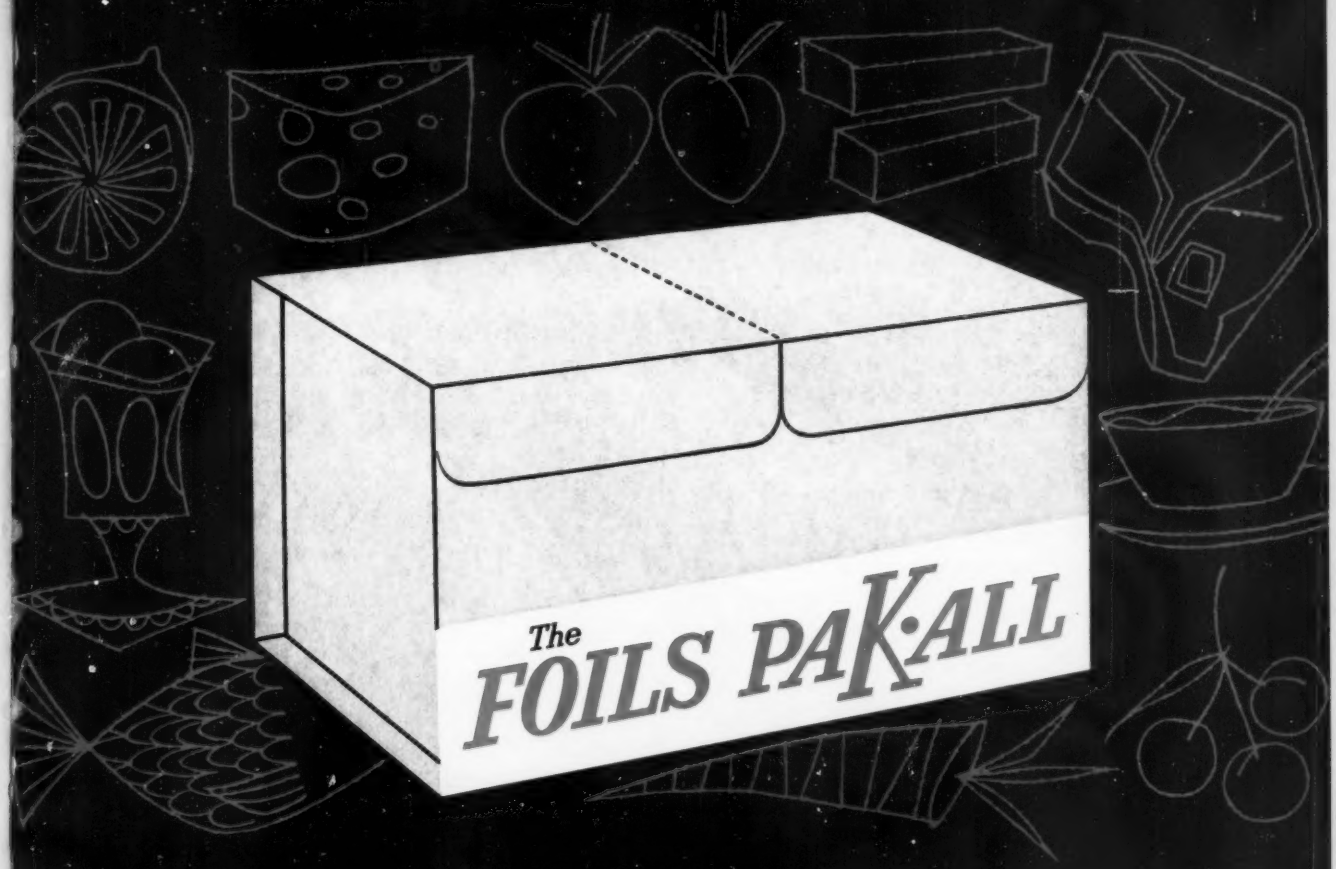
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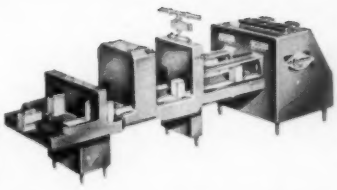


Add New Sales Zip with PaKall Cartons
Half-gallon ice cream carton shown. Others include packaging for: Milk—Butter—Margarine—Cheese—Frozen Fruits and Vegetables—Juices—Freeze-Dry Products—Meats—Fish—Cereal—Bakery Products—Drugs—Soap Products . . . even Electronic Products.

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Liquid-tight paper containers

by Donald Poinier* and J. R. Bennett†

Liquid-tight paper containers are gaining an increasingly important place in packaging. The factors responsible for continued growth in the use of this type of container are:

1. Its single-service aspect fills consumer demand for more convenience.
2. Its adaptability for use in packaging a wide range of products—solids as well as those with a high moisture content or fully liquid.

Basically, there are three types:

1. The familiar paper milk carton
2. The round, nested cup package
3. The cylindrical package used mainly for ice cream.

One of the more important improvements in this type of container has been the successful marriage of paper with polyethylene, and a continued trend toward more use may be expected. Polyethylene linings are available in both the cup containers and the milk cartons. The lining-coating is applied to the paper by an extrusion technique, before the containers are fabricated. The cup package now is available not only with an inside polyethylene lining, but with bottoms coated on the outside with polyethylene, too. Also, some types of food containers have an outside varnish coat, as well as the inside polyethylene lining. Milk containers may be obtained with the polyethylene coating applied both inside and outside.

*Assistant Sales Manager, Milk Container Div., and †National Dairy and Food Container Sales Manager, Dixie Cup Div., American Can Co., New York City.



STACKABILITY dictated adoption of new truncated top for this milk carton. Its polyethylene coating, too, marks trend in milk-carton manufacture, which stems from its economical and protective characteristics. (*American Can photo*)

Milk containers

The paper milk container, which first reached the market in 1934, continues to hit new record consumption figures year after year. It reached the billion mark in 1940, the 10 billion in 1953, and about 15.8 billion were consumed in 1960. There seems to be no foreseeable end to further growth. The major use is in packaging fluid milk, but in recent years chilled juices and various flavored fruit drinks have become prominent users. Because of its light weight and disposability, the paper container is popular in retail stores, which account for an ever-increasing percentage of total milk sales.

Some types of paper milk cartons are shipped flat by the producers to milk plants where they are formed, filled and sealed on automatic equipment, leased or sold by the container firms. Other types are shipped fully assembled.

The paper milk container is available with a flat top, either recessed or with a plug opening, and with a peaked top, with a tear-and-fold-open spout. Sizes are available in ½-pint, pint, ⅓-quart, quart and ½-gallon. A new type of ½-gallon which has a truncated peak that will permit stacking is now being field tested in commercial channels and will be generally available in 1962. A laminated construction is a feature of the package.

Another paper milk container is the cone-shaped type, used by some



BOLD, UNCOMPLICATED design that can be effectively repeated on all three sides of these cottage-cheese paper tubs fulfills need for quick product identification in store or home. (*Lily-Tulip Cup photo*)



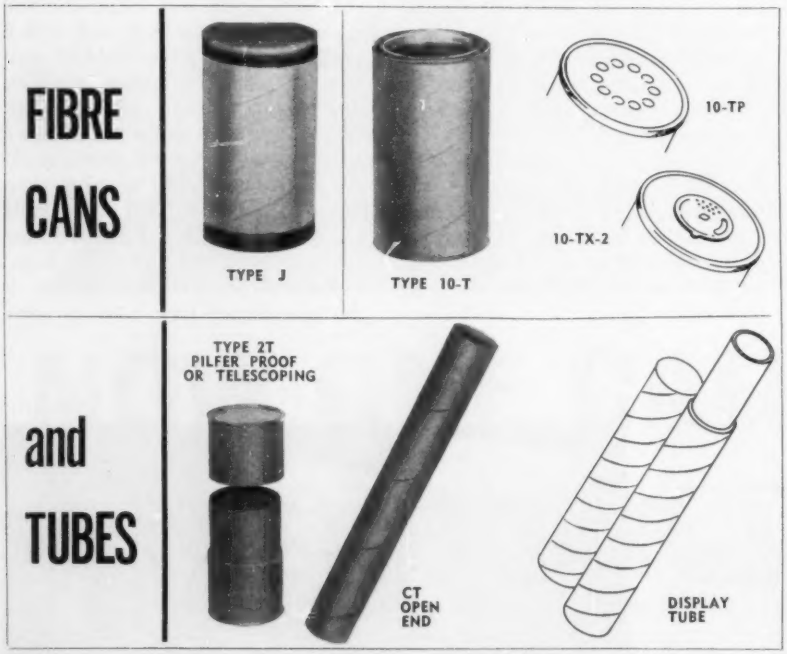
SHIFTS in distribution produce new packages. Sun Dew Corp. added shelf appeal to its waxed paper cartons through strong new surface design, when its soft drinks, previously sold through concessionaires, made debut in supermarkets. (*American Can photo*)

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PAPERBOARD divider in paper-cup container acts as secondary closure and separates two components of industrial adhesive. (*American Can photo*)

dairies that market in glass as well as paper. The cones may be filled and capped on the same equipment that handles glass containers. Still another construction is the tetrahedron container, noted for compactness and ease of filling. In this country, use is generally confined to the ½-pint size.[1]

There is, in the paper milk carton field, a general interest in conversion from wax-coated to plastic-coated board. Despite increased resulting costs, there is definite improved merchandising appeal plus expected improved carton performance.

In paper milk containers, the ½-gallon size shows the greatest growth in popularity. Half-pint and ⅓-quart usage continues sharply upward in accordance with school lunch programs and in vending outlets for automated industrial feeding. Outdoor vendors for quarts and ¼-gallons have also achieved significant commercial status.

Nested containers

Sales of the round nested paper container, in both heavy and light duty, have shown a gain of more than 5% in the decade from 1950 to 1960. On heavy duty, especially, the gains have been sharper in the past few years. The similarly shaped all-plastic package is providing competition to paper containers. Some of the paper-cup manufacturers already are in the pure plastics field, and others are engaged in experimenting.

The round nested paper container has been popular with packagers for many years because of the many advantages. Among them are these: (1) adaptability for many products, facilitated by varied coatings; (2) econ-

1See "Sterile Milk in Paper," MODERN PACKAGING, Jan., 1960, p. 82.



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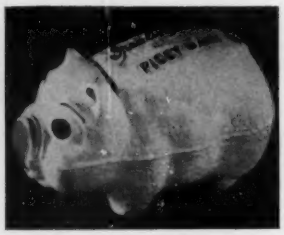
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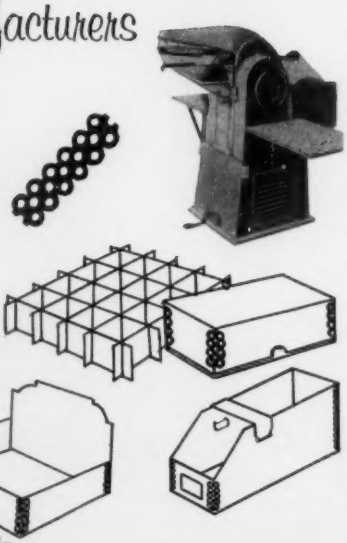
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omy; (3) strength and rigidity; (4) adaptability to filling and capping by hand or by machine at fast speeds; (5) high merchandisability at the cabinet shelf level because of its printability; (6) disposability; (7) stacking facility; (8) ease of use for the housewife; wide top facilitates easy spooning; is reclosable, hence has high degree of re-use, even at table level.

While the use of polyethylene linings is the most important single recent improvement in this type of container, there have been other major improvements. For instance, better grades of paperboard are used; better waxes and techniques for waxing have been perfected; higher surface gloss is made possible; and the cups have been engineered so they have greater adaptability to fast automatic filling and capping. The results from a packager's point of view are improved performance for a greater range of products, and more successful usage based on greater strength, longer shelf life and increasing consumer acceptance.

Great strides have been made, too, in the development of lids for the cup packages. The packager has a wide choice of lids, from the still-popular inexpensive paper insert lid, which seats firmly into a groove about ⅛ inch below the cup rim, to the metal cover-all lid offering maximum retention (hence more product cabinet life) and better appearance because of its adaptability to the most modern color-printing techniques.

Many of the cup packages, which range in size from ½ ounce (for pre-packaging cream, condiments, and the like) to gallons (for institutional packs of salads, meats, etc.) are available from cup manufacturers in stock designs. The user then may utilize the lid for his own brand imprint and product identification.

At least eight distinct types of lids are available, each providing the qualities desired in a lid by packers. Other than price, the important factors considered in choosing a lid are retention or tightness, product visibility, merchandisability, resistance to tampering or pilferage, shelf or cabinet life, and customer re-use.

The eight lid types are the plain paper insert, window paper insert, paper cover-all, opaque and translucent polystyrene cover-all, clear (oriented) polystyrene cover-all, clear polystyrene cover-all with guard ring insert

(Continued on page 228)

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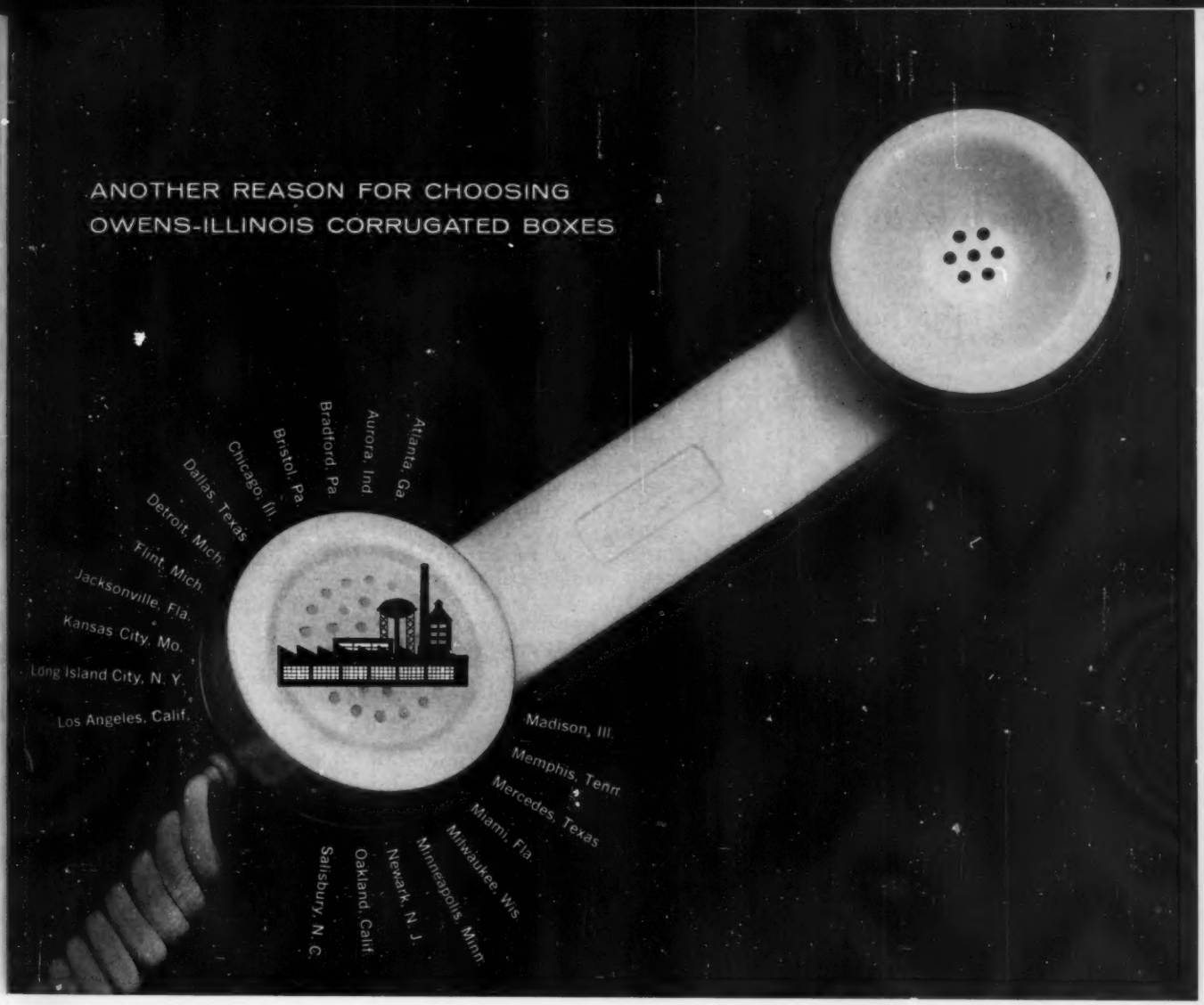
Some of the most exciting products produced in the South are custom packaged by Niemand Industries. A few are shown on this page . . . a sampling of the many manufacturers who have discovered the numerous advantages of having a packaging source near enough for personal consultation and control — close enough so that products being shipped to Southern markets lose no time in getting where they're going! Why not find out for yourself how you can enhance the personality of your product and effect real packaging economies by letting Niemand Industries handle it! Our design and development staff will be glad to consult with you.

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(Continued from page 224)

(ring increases retention), clear polyethylene snap-over, and the metal cover-all.

Virgin sulphite or sulphate stock is used for nested containers—treated or untreated, depending on end use. The common treating material is paraffin, which adds strength, gloss, beauty, and moisture resistance. Other containers are sprayed (coated) on the inside with plastic, but results cannot measure up to the laminated polyethylene lining. No adhesives are used in construction of the polyethylene-laminated cups and the seams are electrically welded, with the polyethylene coating serving the purpose of a binder that holds the cup together.

Packagers also favor the round container because of its sloping sides, permitting nesting and savings in transportation costs, and, because of its flat top, permitting easy stacking. Also, its round shape permits efficient refrigeration.

Packers of convenience, pre-cooked foods are the latest group in the food field to find the round cup-type container to their liking. While it is used mainly for high-moisture-content foods demanding refrigeration, it is also employed for such unusual products as nuts and bolts, seedling plants, tropical fish and tea bags.

In the food line, the nested container is most widely used for dairy products, mainly cottage cheese, plain and in all its variations, sour cream and yogurt. Salad packers also are big users. Other food items found in it are fresh sea foods, fresh meats such as liver, kidneys and brains, bulk sauerkraut, and various desserts.

The round containers are available in double wrap (heavy duty) and single wrap. The double wraps are most in demand. The single wraps are used principally for one important product —ice cream.

Cylindrical containers

A third kind of liquid-tight container, widely used for ice cream, is the cylindrical type. Large sizes, generally reinforced with metal edges, are used for bulk deliveries from plant to retailers.

Consumer packages of this type range from ½ pint to a gallon. With the growth in use of home freezers, the larger cylindrical packages of ice cream, notably the ½-gallon size, have increased sharply in popularity with women throughout the country.

QUESTIONS...

QUESTIONS...

QUESTIONS...

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progress in cleveland containers

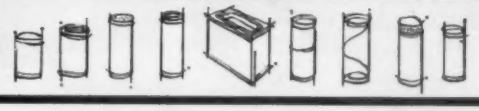
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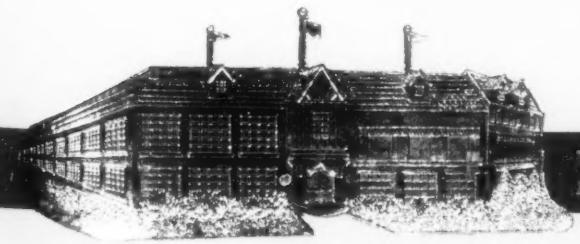
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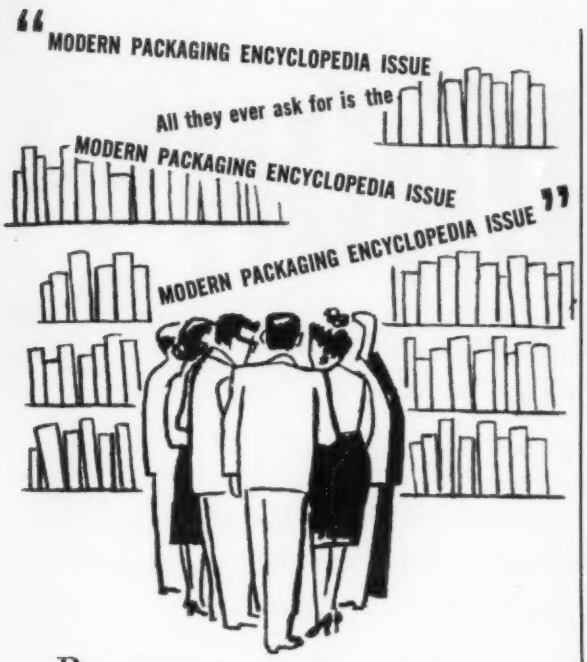
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Merchandising considerations

Successful merchandising of a packaged product today involves more than a matter of a single feature. It is dependent, rather, on the right combination of factors of attractiveness, good display, durability, protection, identity and convenience.

Of prime importance is *protection* of the product. The most attractive package on the shelf is of little value if it does not do a good job of packaging and protecting the product.

Product *identification* and *brand recognition* are two other important factors. Good labeling and design should make product identification and/or brand recognition almost instantaneous from any aspect of display. The consumer likes the familiar brands—the ones she knows and has confidence in. However, the impact of the new package replacing the old cannot be underestimated. The new design or new construction can usually boost sales.

Never before has the American consumer been so pampered and indulged as she is at present; consequently she expects and demands more and more in the way of convenience packages—those which take the work out of the daily chores. The boil-in-the-bag foods, the heat-and-eat dinners, the easily-dispensed product, the single-portion or unit-of-use package and the package that is easily disposed of—all represent consumer demands.

Price, too, plays an important part in the merchandising of a product. However, today's consumer is willing and able to pay a premium for convenience or for anything that will provide more leisure time.

Convenience is not just a consumer consideration. Packages which sell themselves are great assets to the supermarket and variety chains. All packages should carry selling information such as product identification, price, how-to-use, how-to-care-for and any re-use features.

Packages such as the multipacks which increase the unit of sales, the deal or two-for-one promotions, the re-use or dual purpose packages and the blister and skin packs which facilitate handling, reduce pilferage—all contribute to the boosting of sales.

Appropriateness of the package for the product should always be considered. The use of the transparent film package for soft goods merchandising affords the visibility and good "feel" consumers demand in buying soft goods. Yet it provides good protection against damage and soilage.

Packaging for added prestige can have worthwhile results. One company claims increased customer acceptance for its inexpensive cigars after switching from an unprinted to a gold-metallic printed cellophane wrapper.

Pilferage and markdowns have long been problems to the large chain stores and supermarkets. One manufacturer of ball-point pens attached each pen firmly to a card in a manner which allowed the pens to be tested while remaining affixed to the card.

The product which becomes soiled or damaged in display and post-holiday merchandise are candidates for the markdown. A soft-goods merchandiser solved the off-season markdown problem by using cellophane bands to gift wrap two shirts. Holiday-theme bands were easily removed once the season ended.

Are You Missing The Big "C"...

CONTRIBUTION?

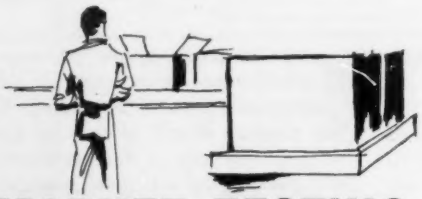
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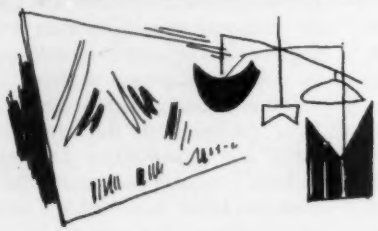
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PRODUCTS

Advertisers' Index By Subject Matter

FLEXIBLE PACKAGES

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SECTION 7

FLEXIBLE PACKAGES

Wraps, overwraps and bundling

by Otto Halbach*

When packages are formed from paper, films or foil—or combinations—they are identified as flexible packages. It's a large category including wraps, pouches, bags, envelopes and related constructions. Advantages and uses of the various types are similar in many cases. The wrap or overwrap, however, has certain individual characteristics to be considered in making the logical choice for a particular product.

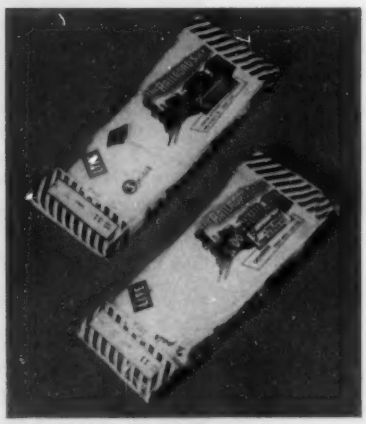
The user of wrapped packages can count on many advances from the flexible materials field including: polypropylene; extensible paper; polymer-coated cellophane; metalized paper and films; improved laminations; improved sealing methods and techniques such as the sealing of foil by high-frequency sound waves; advances in graphic arts techniques such as heat-transfer printing (see p. 625) and improved types of wrapping machines.[1] Some of these developments are already here; others remain to be evaluated or require further research.

Nevertheless, the very breadth of the wrapping field makes it certain that a large percentage of the developments that take place in respect to materials, machinery, techniques and merchandising strategy will provide a very large share of their advantages to the packager who uses wraps. Moreover, the improvements in materials mean that wraps can do more and more jobs and, to an even greater extent than formerly, vie with heavier and more rigid packages on the basis of effective performance in jobs where rigid packages were hardly challenged. This area will always have its limits, but the never-ending search for savings in space, weight and cost make its growth inevitable.

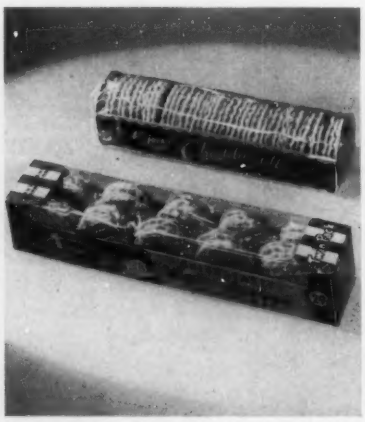
The wrap or overwrap is defined simply as a sheet of flexible material, usually fed from roll stock and formed around the contours of the product or primary package. Terminology is not altogether established for some of the names used in this field. The word *wrap*, however, generally means a direct wrap or wrapper, such as the traditional waxed paper that packages a loaf of bread. The same term is used in referring to the piece of cellophane that encloses a carton of cough drops or a package of cigarettes. This indirect or outer wrap is often called an *overwrap*. A variation of overwrapping, particularly as it applies to the wrapping of multiple units or packages for shipping and distribution, is called *bundling*. Still another variation of a wrap is a band or simple sleeve, which generally has a primary function of labeling the product. Bands, sometimes called label wraps, are usually highly individualized for the types of products that employ them—for example, loaves of bread, packages of frankfurters and

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1 See "Automatic Film Feeding," MODERN PACKAGING, April, 1959, p. 206.



TEXTILE in polyethylene. Four-color overwrap for 2- and 3-pair packages of socks exploits the film's printability, transparency. (*Continental Can photo*)



VERSATILITY of overwrap is shown in firm's cellophane carton overwrap (top) and its fractional pack overwrap (below) boxed in a tray. (*Du Pont photo*)



BUNDLING small cartons in cellophane aids shelf storage, identification and fast inventory counts, and protects consumer units. (*American Viscose photo*)

certain types of produce. In this category, too, are many of the sleeves used to dress up gift and holiday packages. However, a full overwrap frequently can be used in this way just as effectively as a band or sleeve.

Frequently a number of wraps will be used in combination. Examples of such *multiple wraps* are those used for lozenges and chewing gum. In such instances, the multiple wrap performs several chores including the grouping of several individual items, specialized protection and labeling.

Bundling. This is generally an overwrap that groups a number of products or packages into a shipping or jobber package. Bundling is usually accomplished by attaching an assembler to a wrapping machine. There are many advantages to be obtained from bundling, including economy of materials, ease of production, ease of handling in storing and shipment and ease of opening.[2]

Selection factors

A wrap generally is indicated when these factors are involved:

1. *Minimum materials, space and effort.* Since the wrapper is applied as a tailor-made fit to the individual product or inner package, a minimum of material is used. This also tends to provide a very desirable characteristic —neatness. Also, since a wrapper uses the most versatile and lightest of packaging materials, it adds practically no additional bulk to the package or product. For a product such as a loaf of bread, which by its very nature takes up a lot of shelf space, the wrapper is an ideal package providing, as it does, both a protective and a sales point of view.

2. *Protection.* This function, which ordinarily comes first in any list of packaging selection factors, is one that wrappers perform very well, particularly so in relation to unit cost. Practically any degree of protection can be obtained, with the exception of rigidity and certain levels of sealing and resealing. However, wraps are often combined with boards, trays, cartons or other rigid forms to provide an extra degree of protection and usually this function will be abetted by another—merchandising appeal.

Wraps perform remarkably well in protecting some very fragile products such as cup cakes and some very perishable or flavor-critical products such as produce, bacon and butter. Visibility is quite often an important characteristic, since it automatically encourages careful handling. On the other hand, opacity can be specified for products such as butter that need protection from light rays and where special materials are also desired to protect against odor loss or gain. Another testimony to the protective performance of wrapped packages is found in the fact that many of the products so packaged are sold in channels of mass distribution where extensive and often rough handling occurs and where repeated losses from package failure cannot be tolerated by either the producer or the retailer.

3. *Economy.* Because wraps employ a minimum of material to package a product and because the flexible materials are low-cost in relation to the level of performance desired, the wrapped package is usually most economical. Add to this the fact that wrapped packages are always produced by the packager who has the choice of hand, semi-automatic or fully automatic operations; thus efficiency and versatility are favored. The light weight of wraps contributes further to shipping economy.

4. *Merchandising.* The wrapped or overwrapped product or package draws on a full range of materials, graphic arts effects and design versatility. Although wrapped packages are generally associated with mass-distributed items, where utility may be more appropriate than fancy appearance, it is a fact that this type of packaging ranges through the full gamut from plain to elegant. In fact the very term, *gift wrap,* is associated with the most luxurious and beautiful types of packages. Wraps provide any conceivable type of merchandising effect without any loss of display value.

5. *Convenience.* Wraps provide the packager with convenience in the choice of materials, wrapping methods and ease of handling. There is further convenience in handling and shipment. Wrapped packages help the retailer because they are lightweight; they contribute to fast turnover and help avoid losses due to waste that occurs when packages are not handled properly for quickest possible turnover. Wraps are convenient for the shopper. Wraps are easy to open and dispose of. They provide features such as visibility, opacity or both; easy folding for reclosure; traditional shapes such as butter wraps or soap wraps that make products easy to identify. Wraps are especially convenient for protecting unused portions of foods; also they are by nature safe to handle. These and similar characteristics add up to a friendly and well-liked personality for wraps and overwraps.



OVERWRAPPING stationery items in tough, transparent cast polyethylene reduces damage from handling. (*Eastman Chemical Products photo*)

End-use categories

Traditionally, wraps have been developed for various product categories. The reason for this was partly because it was most practical in the interest of economy and uniformity to develop equipment for specific types of products. Thus, there are wrapping machines that have been designed specifically for bakery products, dairy products, meats, cigarettes, cigars, candy, chewing gum, frozen foods, bar soap, paper products and textiles. Within these categories are many types of wrapping machines that have been developed to apply direct wraps or to apply wraps to a variety of flat boards, trays or carton styles. (See "Wrapping and Bundling Machines," p. 470.)

There will always be an increasing interest in the specialized wrapping machine, particularly for units that will attain higher levels of speed, performance and automation. In recent years, however, there has been an even greater interest in versatility—in machines that would handle a wider variety of products and sizes. This interest in versatility often prevails even when higher speeds must be sacrificed. One reason for this is the greater variety of products and sizes that a packager merchandises today and the increasing challenge to

[2] See "Bundling in PVC," MODERN PACKAGING, Sept., 1959, p. 129.



METALIZED polyester year-round gift wrap bag upped sales for champagne maker. Packaging is a hand operation here and bag is closed at the neck by quarter-inch cord wound with metallic yarn. (*Dobeckmun Co. photo*)

add new products, such as the specialty and convenience foods, to his line.

Constructions

The most practical conclusion to make in regard to wrapper construction is to regard each and every wrapper as an individual problem—one that requires continuing study as new developments in materials, machinery and merchandising occur.

Most wraps for cartons or products of uniform shape form a simple tube or sleeve shape about the product or package and then make some type of end fold. End folds are determined by the customer's preference and by the make of machine he specifies. Among the types of end folds for a tube or sleeve-shaped wrap are the double-point end fold, which gives a full printing end surface; the single-point end fold, which gives a symmetrical panel and the reverse single-point panel.

When there is no uniform surface to seal against, as is the case in many supermarket meat packages and in packages of shingled bacon, a turn-under fold is made at the bottom.

A twist type of closure is employed in the wrap for candy kisses, round candy drops and similar spherical or odd-shaped products.

Closure for wraps may be effected with adhesives, heat seals or simple folds depending on the type of wrap and the type of protection needed. The different folding characteristics of paper, films and foils can be used to good advantage for many different products and types of wraps, since a range from springy resilience to dead fold can be obtained. Hershey's chocolate kisses are a good example of a product that uses the fold characteristics of foil to achieve both a convenient and distinctive wrap.

Seals range all the way from peelable types, such as those desired for bread, to packages so tightly sealed that they must be torn or opened with a special string or tape. This choice of seal and opening is still another characteristic of the wrapped package that makes it practical in meeting the needs of the packager, the retailer and the end user.

Materials

Virtually all types of paper, film, foil or laminations used for packaging (see sections starting on pages 76 and 120, and especially the properties charts in these sections) are candidates when selecting a material for the wrapped package. Waxed paper, plain sulphite, kraft, tissue, parchment, cellophane, polyethylene, Pliofilm, acetate, saran, foil and several laminations are favorite materials for the purpose at hand.

Changes and improvements are constantly being made in everyday wrapping material. Attention to the minor changes of strength, gloss, scuff resistance, flex, barrier properties, surface finish and the like can result in improved performance, reduced costs, greater machine efficiency and better merchandising results.

Important gains have been made in the use of polyethylene—especially in overwrapping of paper products. Its protective and shelf-life characteristics are highly desirable and its cost is such that it could be one of the most economical materials for wrapping and bundling. (See cost table in article on p. 12.) Currently, machines are being adapted so that the handling and sealing characteristics of this and certain other soft films will not be a handicap.

Another promising development is the prospect of using oriented polystyrene film as an overwrap. Again the cost is relatively low. Excellent clarity and dimensional stability are afforded. It is claimed that heat-sealing problems are being solved and in a relatively simple way. Also, heat application tends to tighten overwrap fit.

Excellent use of polyester film as an overwrap, particularly in bundling applications, has been experienced by packagers because of the material's great strength plus its visibility.

Today's products and trends in packaging them, particularly the demand for higher speed, place a premium on gentler handling.

Know your materials so that within a given framework of cost you can determine which material will give best performance.

The dimensions of the wrapped package must be carefully designed, especially if the machine is not self-measuring of the wrapper.

In general, when there is a solid surface against which to make an end seal, this type of seal will be most economical and satisfactory.

Correct handling of wrapping materials will go far in avoiding inefficient wrapping operations. It is extremely important to receive, store and handle wrapper roll stock according to recommended practices.

The use of automatic splicing units is becoming more desirable to keep a constant-flow packaging line up to best operation.

Design should not require too great a precision of register. Devices such as scalloped design should be considered to allow a practical degree of tolerance.

Determine which areas will permit ink application so that sealing problems do not arise. This is less and less a problem because of improvement in inks. Nevertheless, area design deserves careful study to determine practical limits.

Excellent opportunities exist for successful use of wraps in multiple and fractional packaging; in gift packaging such as is done in packaging holiday liquors; and in the packaging of convenience foods. Other types of packages will do these jobs, too, but when a wrap will do them, it is frequently economical, efficient and convenient for all concerned.



PRODUCE-TYPE polyethylene bags come in 10 sizes, flexographically printed in three- and four-color designs, varying with the produce. Item name is on a strip and the back of the bag is clear for product inspection. (*Dobeckmun photo*)



"SECRET POCKET" in glassine envelope offers important promotional advantage. Trading card is put in inner pocket during fabrication. Method is sanitary, economical; practical for recipes, different type cards, etc. (*Kehr Products photo*)

BAGS—types and uses

by George Buchanan, Jr.*

A bag is a two- or three-dimensional package formed from flexible materials, with a bottom and a back or side seam secured by adhesives, heat seal, stitching or combinations of these, and delivered in collapsed form. (See also article on pouches and packets, p. 243.)

Bag sizes used for retail containers now have an extremely wide range. They vary from 1- or 2-oz. up to 25-lb. units. It is interesting that, as our retail stores have grown in size, so have the upper size ranges of consumer packages. It is not uncommon to find 25-lb. items on the shelves of our markets where formerly a 5-lb. or 10-lb. item was the maximum. (See also "Heavy-Duty Bags," page 688.)

A packager finds many advantages in bags for retail products. Their light weight and compactness make them economical in shipping and storage. They are readily disposable and nonreturnable. With a sealed closure, they are tamperproof because they are destroyed upon opening, thus preventing pilferage and false branding. Bags also answer a variety of packaging needs because they have no size standardization. Their infinite dimensional variation is especially valuable if the product is not dump-filled but has a fixed size and shape.

The versatility in bag construction permits the use of either single or multiple plies which enables the packer to make an economical choice from numerous types of papers, films and foils to obtain various protective qualities. He can choose his materials according to strength, printing surface, moistureproofness, greaseproofness, permeability to gases, etc. When a single ply of material cannot be found to fill all the requirements to pack a given product properly, he can resort to a combination of two or more plies to obtain the necessary results. Thus, if need be, a bag can be made from a combination of different papers, films, foils or laminations. (See article on laminations, p. 149.)

For many years, one of the bag salesman's most commonly used arguments has been that bags are the most economical container. In the majority of cases, this statement is still true. Today, moreover, bags constructed from multiple plies of foils and films are taking on some of the jobs formerly performed by rigid containers.

Styles of construction in bags fall into four main types—flat, square, automatic and satchel. Some other names used are: *square*—old style square or O.S.S., pinch bottom, V-bottom and wedge shape; *automatic*—self-opening style or S.O.S., flat bottom and intuck; *satchel*—sack and flat tube bags.

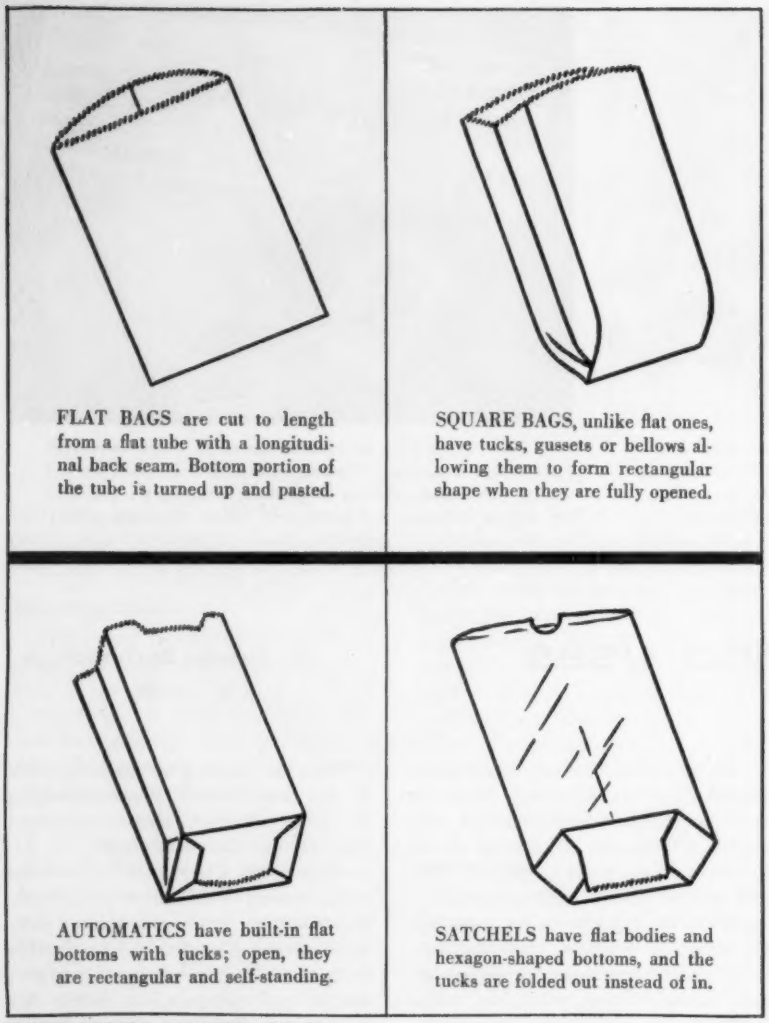
Bags are playing an important role in the development of pre-packaging of fresh produce, meats and even hardware at the retail level.

Bags using a heat seal in the seam areas instead of adhesives are steadily increasing in number and for a very good reason. The demand for flexible bags to package products of a hygroscopic and deliquescent nature has stepped up their water-vapor barrier requirements. Thanks to modern science, proper materials are available to give the needed low water-vapor



SIFT-PROOF bag with heat-sealed construction and flat block bottom is ideal for the protective packaging and shipping of hygroscopic products in finely powdered form. (*Continental Can photo*)

* Flexible Packaging Div., Continental Can Co., Devon, Pa.



FLAT BAGS are cut to length from a flat tube with a longitudinal back seam. Bottom portion of the tube is turned up and pasted.

SQUARE BAGS, unlike flat ones, have tucks, gussets or bellows allowing them to form rectangular shape when they are fully opened.

AUTOMATICS have built-in flat bottoms with tucks; open, they are rectangular and self-standing.

SATCHELS have flat bodies and hexagon-shaped bottoms, and the tucks are folded out instead of in.

DRAWING COURTESY CONTINENTAL CAN CO.

transmission rate: foil, cellophane, glassine, saran, Pliofilm and polyethylene.

Where a product requires an unusually low water-vapor transmission rate, a single film in the flexible gauges used for bags may not supply the required protection. Then, by resorting to a combination of two or more individual films, and including paper where advisable, it is possible to obtain practically any degree of protection and strength. You can go even further and specify lamination with wax, polyethylene, foil or vinyl for moistureproof properties.

The operation of packing and closing bags, once entirely manual, is now largely semi-automatic or fully automatic. Mechanically, the filling operation is the most complicated because it involves specialized machinery for opening the bag as well as precision equipment for measuring the contents either by weight or volumetrically. The commercial opening devices on the market employ expanding metal fingers, air blasts, suction cups or combinations of all three.

When a packer installs a new mechanical device for handling bags, it is of the utmost importance that the container suppliers are so advised and, if necessary, referred to the machinery manufacturer. A failure to do so may result in receiving bags made to specifications that do not function properly on the packaging machinery.

The speed of any opening and filling line is governed by the filling mechanism which usually has a ceiling speed of 30 to 40 packages a minute depending on whether it is net weigh or volumetric. The gravity flow of the product determines the type of mechanism that can be used. If acceleration is important enough to warrant the additional expenditure, multiple filling heads can be incorporated in the lines.

The closing of bags is accomplished by several methods. Metal ties applied to the bags either at time of manufacture or when packing have the advantage of permitting reclosure after the consumer has initially opened the bag. Heat sealing affords a tamperproof closure and may be obtained by specifying a thermoplastic band at the bag mouth if heat-sealing film is not employed in the bag construction. Gluing, stapling and sewing also are conventional methods, and plastic-covered wire or similar ties are used.

Closing machines are most often available in the heat-seal type. Securing a closure by the use of metal staples is a popular method with nonfoods. Sewing heads for providing a stitched closure are especially useful where strength is needed and stitching can be given additional reinforcement by sewing through kraft tape.

Opening devices at consumer level usually consist of printed directions and dotted lines indicating where the customer is to cut or tear to open. Tear tape, tear string and a runner thread on sewn bags also are used.

As a merchandising tool, bags offer splendid mediums for sales display. The packer can choose opacity, semi-transparency or full transparency. Opacity may be obtained by printing clear film in a solid design with dense inks, as well as by using paper or foil in one or more plies. Visibility packaging is obtained with transparent films and with glassine. Also belonging in this category is the die-cut window bag formed by dieing out a window through the opaque paper or foil and covering it with film or mesh.

For artistic designing, the bag industry supplies multicolor printing up to and including six colors by letterpress, rotogravure or flexography.

Letterpress, using modern quick-drying resin-base inks, produces the highest gloss obtainable on paper. Coupled with good designing, this gloss contributes immensely to eye appeal. Beautiful halftone illustrations can be reproduced on paper bags.

Rotogravure holds the same position in printing films and foils as letterpress does in paper.

Flexography is the economical work horse in bag printing. Its quality has not risen to the level of letterpress or rotogravure, but there are many applications where it can fill the bill.

The modern pouch package

by W. T. Boston*



NEW packets for dry salad-dressing mixes were developed to preserve flavor, oils and fats, act as water-vapor barrier, provide printing surface for full-color illustrations of salads, and save space in store and home. Material combines (from outside in) reverse-printed cellophane, polyethylene, paper, foil, vinyl coating for heat sealing. (*Dobeckmun Co. photo*)

Adaptability, functional performance, low cost and merchandising effectiveness account for pouches being such a major form of packaging. Paced by continuous improvements in materials and in pouch-forming-sealing machinery, pouch packages play an important part in modern marketing of mass-distributed foods, hardware, drugs, personal products and industrial goods.

Convenience and economy are two of the strong points favoring the choice of a pouch. Witness the host of unit-of-use and portion-control packages employing pouches. Another important characteristic of the pouch is the wide variety that can be achieved in styles, shapes, sizes, display and decorative features, as well as in materials and in functional advantages.

The popularity of the pouch package has created a great demand for high-production as well as cost-saving automatic packaging machinery. (See article on pouch formers, fillers, sealers, p. 487.)

The wide variety of products to be packaged has led to the development of many machines to package these products, and has created diverse package forms.

*President, Bartelt Engineering Co., Rockford, Ill.

For definitive purposes, only those pouches which can be made, filled and sealed on automatic machines are considered here. Pre-formed pouches, of course, are produced by many suppliers and are similar in construction and purpose to the types discussed here. (See also article on types and uses of bags, p. 241.) For purposes of definition, a pouch package is one made from heat-sealing, flexible roll stock material.

A primary classification for them follows: Pouches can be (1) vertically-made; (2) horizontally-made; (3) mandrel-formed; or (4) developed as specialties.

Vertically-made. In general vertically-made packages fall into these types: (1) pillow-type, lap seam; (2) pillow-type, butt seam; (3) four-side seal; (4) side gusset, lap or butt seam; (5) three-side seal, fold one side. All these can be made on a variety of machines operating by forming a tube or bringing two webs together. The web is pulled down from above, sealed, filled and discharged.

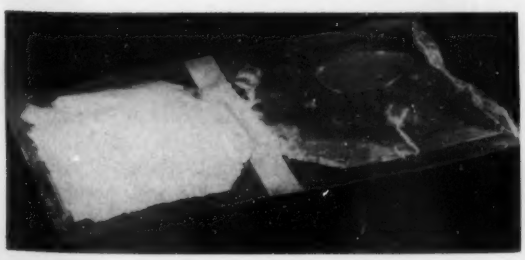
Horizontally-made. It is somewhat more difficult to classify horizontally-made packages because of the wide variety of styles, but these are typical: (1) three-side seal with fold on bottom; (2) four-side seal; (3) gusset bottom; (4) sandwich-type, four-side seal; (5) wrapping machine types which form web horizontally in a manner similar to that of vertical machines.

Mandrel-formed packages. Whereas mandrel-formed pouches have not generally been included in definitions of pouch packages, developments would indicate that box liners are being fashioned as pouches and should be considered in this field. Mandrel-type formers are designed to perform some of the same functions as conventional pouch formers; also they can package the same types of products.

Specialties. There have been many pouches developed for special purposes on various machines. They can be classified as follows:

Multiple-material pouches. Various combinations fall under this division. Pouches are made with one material for the back of the package and another for the front. This would necessitate a four-side seal. An example: kraft-paper back wall and a cellophane front wall. Another example: double-wall bags. These can be of like material such as a double cellophane pouch, or can employ different materials such as a polyethylene inner pouch and a glassine outer pouch. Many combinations are possible.

Multi-compartment pouches. Pouches with a number of individual com-



SELF-MIXING pack. The liquids can be pressed through the rupturable seal to mix with powders. It is used for products such as quick fresh salad dressing and hot cakes. (*William Steven photo*)



CIGARS have moisture protection in aluminum foil laminated to paper and polyethylene. Pull of string opens pouch, fold over of foil recloses. (*Alcoa photo*)



POUCH WITHIN A POUCH. Squeezing breaks the inner sealed pouch, and chemicals combine. A shake, and the instant ice is ready. (*Tower Packaging Co. pouch*)



FOUR-PACK with perforated strips for easy separation is made of cellophane laminated to foil. Attractive design is printed by flexography. (*Milprint pouch*)



CONTOURED to identify product. Pouch for moisture-sensitive powdered chemical is triple lamination of 25-lb. pouch paper, 15 lbs. of polyethylene (1 mil) and 0.00035-in. aluminum foil. (*Pouch and forming machine, Ivers Lee*)

partments are possible and they are formed by applying horizontal or vertical—or both—dividing seals. To facilitate consumer usage, the individual compartments are often separated by perforations. Such pouches can be made on almost any type former.

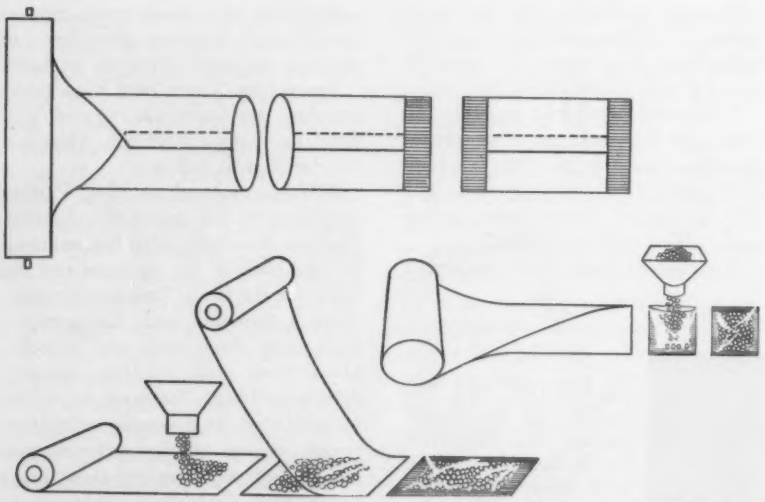
Two-pocket pouches. Machines have been built to form a pouch consisting of two walls with a divider in the middle. Such a pouch can be used to package a different type product on each side. When such a package is opened, both products must fall from the pouch at the same time. These pouches are used for chemical products such as hair-wave neutralizers and developing solutions.

Saddle-label pouches. It is possible to attach a saddle label on a pouch-style bag by applying it at the time the pouch is made.

Tube-sealed packets. Recently there have been some semi-automatic machines made to handle tubes. A long tube is filled with a liquid and sealed. It is then run through a machine which stamps out small packets by sealing through the contents.

Functionally, a pouch package can effectively protect many kinds of products that are not subject to breakage. The name, "flexible" pouch, indicates the difficulty of packaging fragile items in such a container. However, today's combinations have sufficient strength and protective qualities to contain adequately items that heretofore were practical only in glass, tin or other rigid containers. In contrast to glass and tin, most pouch packages are not liable to be damaged if they are dropped or if they receive a direct shock.

Since pouch packages are used for a limitless field of products, standardization has been difficult. If the product demands a unique protection, specific web combinations are developed. Various merchandising programs call for new materials attractively printed to create spectacular appearances. Others are unprinted when appearance is of minor importance. A pouch package can range from the most inexpensive construction, such as straight polyethylene, to very expensive combinations—for example, those used for nitrogen packaging. (See articles on laminations, p. 149, and pouch-forming equipment, p. 487.) Shelf life will, accordingly, range from a matter of days to well over one year for perishable items.



BASIC CONSTRUCTIONS. *Pillow type* forms cylinder from single web. Bottom seal for pouch to be filled is made when top of filled pack is sealed. *Sandwich type* encloses product between two webs sealed on four edges. *Three-side* seal forms V-fold in single web. Variations are butt or lap seams, gussets, multi-pockets, strips, double walls, saddle labels.

Vacuum and gas packaging

by William E. Young*

Canning, in both metal and glass, has long been the leading method of preserving most perishable foods. Sterility is essential when canning moist food products; this is usually achieved by processing the filled container at an elevated temperature. As long as this container remains hermetically tight, the atmosphere and its microorganisms are unable to enter and cause spoilage, making it ideal for long-term protection.

Unfortunately, many foods lose their eye appeal, flavor and texture when subjected to the temperatures required to render them sterile. Many fresh foods such as fruits, vegetables and meats will keep well when frozen, since bacteriological activity is nearly at a standstill at freezer temperatures. Other fresh foods are processed into products with improved keeping qualities, such as fresh meats into sausage products, and milk and cream into butter and cheese. Under refrigeration, an item such as bologna keeps well in its casing but, once a portion has been cut off, the exposed end dries out and gets a "strong" taste rather quickly. In the delicatessen, the clerk must discard a thin outer slice if his customer is to be pleased. Natural cheeses often are protected by a wax coating but, once cut, pose a problem similar to that of bologna, and further complicated by molding.

The modern consumer demands that cheese and ready-to-eat sausage products be pre-sliced and available in 6- or 8-oz. package units. Eye appeal is important, necessitating a transparent package or one with a window. Merely wrapping most sausage items serves only for a day or two, after which dehydration and deterioration begin to make them unpalatable. An analysis of why the sausage casing (or wax in the case of cheese) protects its contents immediately suggests the vacuum package—the factors common to the casing and the wax are intimate contact with the food, leaving no space for air, and being a barrier between the food and the atmosphere.

The first vacuum packages employed cellophane as the oxygen barrier, because it was the same type of material used for most sausage casings. Pliofilm first and polyethylene later were laminated to the cellophane to provide an adhesive surface so that a vacuum package could be constructed, since uncoated cellophane cannot be joined directly to itself to produce hermetic heat seals. These materials also made up for some of cellophane's mechanical deficiencies, imparting toughness to the package. Heat-sealing polyester[1] has recently replaced cellophane in packages requiring a more rugged construction, or where the polyester's thermoforming properties are needed. All of these materials retain their flexibility at refrigerator temperatures, a must in flexible vacuum packaging.

While vacuum packaging solved many of the distribution problems involved with sliced cheese and processed meats, it created a new one. The sheer force of atmospheric pressure on some sliced products like Swiss cheese and dried beef caused the slices to weld together, making it impossible to separate them without tearing them to bits. This problem

* William E. Young & Co., Little Falls, N. J.

1 Du Pont "Mylar" film.



LARGER VACUUM PACKS required for products such as frankfurters, are produced by this machine that forms, evacuates and seals. (*Standard Packaging Corp. photo, Mahaffy Engineering machine*)



MEDIUM-OUTPUT machine is used for vacuum or gas packaging of luncheon meats, cheese. (*Standard Packaging photo*)

Oxygen transmission rates of flexible packaging materials

Average oxygen transmission rates under refrigerated display conditions

Material	*Cc. per 100 sq. in. per day per atmosphere pressure differential*
1-mil double-wound saran film	0.5
Polyvinylidene chloride coated cellophane or polyester film, alone, or laminated to polyethylene	0.5
½-mil biaxially oriented polyester film, laminated to polyethylene	2.0
MSAD-86 or MSB-6 cellophane, laminated to polyethylene	5.0
2-mil polyethylene, low density	80.0[1]

Information in this table based on studies conducted by Carl Brickman, Standard Packaging Corp., of popular packaging materials in the order of their oxygen barrier properties.
1 This material is listed for purposes of comparison. Most vacuum-packaged perishable foods will not tolerate a rate above 5 cc. and many require a rate under 1 cc. to assure a three-week shelf life.

was solved by replacing the air about the slices with nitrogen, an inert gas. Nitrogen, of course, is harmless, as it is the major constituent of the air we breathe. It acts in the package as a cushion or pillow, protecting the slices from the force of the atmosphere. Packaging in nitrogen serves the same purpose as vacuum packaging since both methods provide for eliminating oxygen, the element required for most of the processes involved in food spoilage.

Methods and machines

The earliest successful attempt at flexible vacuum packaging involved pouches into which bacon was loaded manually. Three or four filled pouches were stood vertically and edge to edge in a chamber with an open top. Each side of the chamber top contained hinged flaps, one of which mounted a rubber pad. The padded flap was folded down, partially covering the chamber, and the open pouch mouths were neatly laid over it on its rubber pad. The other flap was then folded down loosely over the pouch mouths, holding them in position. A second chamber with a rubber gasket on its face was next brought into hermetic contact with the first, completely enclosing pouches and flaps. This unit was evacuated to the desired degree, removing the air from both inside and outside the pouches. Since the air pressure outside as well as inside the pouch always was substantially equal, there was no tendency to collapse or distort the pouches and the pouch mouths remained flat and unwrinkled. After evacuation a hot seal bar mounted in the second—or upper—chamber descended, pressing the pouch mouths against the rubber pad, and sealing them hermetically. The atmosphere was then admitted, collapsing the pouches about the bacon, the seal bar lifted and the upper chamber removed. The lower chamber was lastly inverted, and gravity opened the flaps and dumped the finished packages into a pan.

A review of the principles involved in this operation is quite pertinent, for they are still being considered in some current approaches to vacuum packaging.

Multi-chamber machines working on this cycle were built and installed for packaging sliced luncheon meats and cheese, as well as bacon. Although they proved flexible vacuum packaging to be feasible, they were slow and labor cost was high. But, most of all, the percentage of "leakers" was too high. With high package cost this was intolerable.

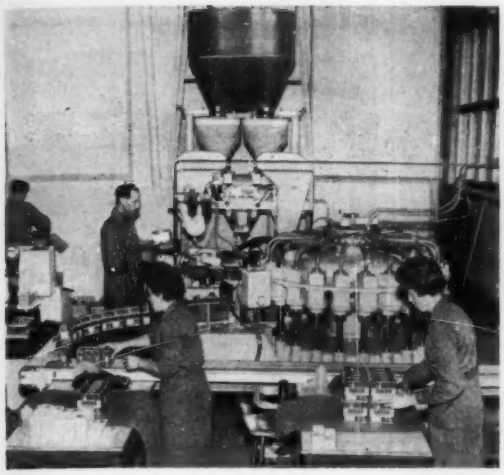


PRODUCT protection and contour display are plus features of vacuum package formed of pliable, specially laminated saran. (*Dow Chemical film*)

Analysis of leaker causes showed the major culprit to be wrinkles in the top seal—the seal made in the vacuum chamber. This directed the next development, which provided a mechanism for mechanically gripping the ends of the pouch mouth in the vacuum chamber and stretching the pouch mouth out over the rubber seal pad, thus eliminating all wrinkles from the seal area.

Perfection of this development brought commercial success to flexible vacuum packaging and was followed by a machine which introduced nitrogen into the pouch after evacuation, but before sealing. This opened up the process to nuts, candied fruits, dried beef and even the softest sliced cheeses.

While these developments were taking place, other approaches were being made to nitrogen packaging which dispensed with the vacuum step. After loading the pouch, a tube is inserted to the bottom through which nitrogen is introduced, displacing the air from the pouch, then the tube is carefully removed and the pouch sealed. A fairly good package can be made this way, provided the food product is not too porous, but the process is slow and uses a great deal of nitrogen to purge the air from the pouch. More efficient use of the nitrogen can be made if the product passes through a nitrogen-filled zone, such as a hopper, and the pouches are loaded in an adjoining enclosure filled with nitrogen. A process like this requires highly engineered machinery. Since pouches cost a lot more than the roll stock from which they are made, it was logical that gas-flushing machinery was designed to work with roll stock rather than with the pouch. There are two types of such equipment in use today. One forms a tube from a single web of roll stock, enclosing the spaced stacks of cheese on the web. A longitudinal heat seal is made, then cross-seals are made between the stacks, which are severed along their centers to form the individual packages. A tunnel encloses the region where the web forms a tube about the stacks and retains the nitrogen. The nitrogen is introduced through a long, thin nozzle extending above the cheese inside the package tube, all the way to where the transverse seals are made. The other type of machine uses two webs of material, producing a package which looks like the usual pouch. Successful operation



NEW DIRECTIONS for vacuum and gas packaging are pointed up by this automatic Swedish packaging operation for pre-ground coffee in cartons. An impervious liner—a laminate of paper, foil and polyethylene—makes it possible. This machine sets up and fills pre-lined carton, exhausts the air and replaces it with inert gas—then heat seals the liner. The rate is 60 cartons a minute. (*Esselte Forpackning AB machine*)

of both machines requires freedom from wrinkles in the seals.

The roll stock concept, meanwhile, was under consideration for the vacuum package. The introduction of heat-sealing polyester, which can be thermoformed into cups with flanged, flat edges for a wrinkle-free seal, made it possible to reduce the excess film around the food stack to a minimum. Heretofore, with nonformable cellophane, considerable "head space" (or excess material) had to be provided around the stack so that the bulk of the stack wouldn't induce wrinkles at the seals. Although polyester costs much more than cellophane on an area basis, the reduction in area made possible by thermoforming, often as high as 50%, more than makes up for polyester's greater cost.

The machine, using one formed and one flat web, has proved very efficient in operation up to 90 packages per minute, and is also used for vacuum-gas packaging. The latest machine of this type has been specifically designed to turn out a two-layer, 1-lb. frankfurter package. It loads the wieners automatically into thermoformed cups, covering them with a second web, then sealing and evacuating the package for extended shelf life and attractive appearance. Because of the very small premium cost of this new package over ordinary overwraps, it is likely to become the norm for frankfurter packaging in a few years. An interesting newcomer is a 1-lb. frankfurter package formed in two ½-lb. units banded together. Each unit is thermoformed both top and bottom, adding attractive appearance to the convenience of being able to keep half the package intact when opening the other half. Although this package uses twice the area of packaging material that the two-layer package uses, it is well-designed to find favor among smaller families.

Although automatic roll-stock machines of the type mentioned above have found wide favor, the hand-loaded pouch type machine is still needed for specialty products, and for the smaller volume packer.

Because of the distortion of the pouch mouth encountered when trying to seal a pouch evacuated outside a chamber, such machines have not been successful commercially. A notable exception is a machine which seals the pouch mouth before evacuation, then punches a hole into one side of the pouch through which the air is evacuated, and gas admitted when desired. The pouch faces are then sealed to one another, forming a sealed "ring" about the hole. If distortion is held to a minimum and bad wrinkles avoided, a fairly low leaker percentage may be achieved with this equipment, although it is difficult to achieve high vacuum at desired production speeds.

Vacuum and gas requirements

As a rule of thumb, a package should be evacuated in a chamber to an absolute pressure of 25mm. (29 in. of vacuum) for processed meat products, or 15mm. (about 29¾ in. of vacuum) for natural cheeses. If nitrogen is then introduced, the oxygen will measure less than half of one percent of the total gas in the cheese package, or less than one percent in the meat package. These low oxygen levels will be adequate for most

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TURN TO SECTION 3

Page 105

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LOW GAS PERMEABILITY of polyethylene-saran coated polyester, combined with high clarity make this film popular and effective for vacuum packaging of processed meat. (*Du Pont photo*)

products, but even lower levels may be required with some meat formulations to avoid discoloration, even though flavor may be unaffected. Vacuum of this degree cannot be achieved with either a reciprocating piston or ordinary rotary vane pump; the so-called rotary piston pump is essential. This is a relatively expensive piece of precision machinery and the greatest care must be given to its selection. Even though a particular pump may do the vacuum job, it may not be able to tolerate packing-house conditions without expensive maintenance and the chance of costly shutdowns.

Whatever pump is selected, it must be closely coupled to the packaging machine, with the correct size pipe, to achieve best results. Nothing else may be hooked into this vacuum line while the machine is in operation. Although vacuum tanks, or reservoirs, have been proposed, mathematical computation will quickly prove that any such unit in the vacuum system will result in poorer vacuum in the package.

Ordinary vacuum gauges are not sufficiently sensitive to check high vacuum-packaging systems. A specially selected absolute pressure gauge must be used, since normal geographical and meteorological variations in atmospheric pressure—plus machine fluctuations—render vacuum gauge readings of limited value. As a quick guide, however, 30 in. of vacuum at sea level represents "perfect" vacuum or zero mm. absolute pressure, and 29 in. of vacuum represents 25mm. absolute pressure. Less than 29 in. of vacuum is usually inadequate for vacuum packaging.

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packages, or for thermoforming of package materials, a maximum of 25 inches of vacuum (125mm. absolute pressure) is adequate. Many ordinary piston and vane pumps do a good job for these operations. Specially designed pump combinations are available for use with packaging machines which require auxiliary vacuum in addition to the high level of vacuum needed in the package. These often employ reservoirs in the auxiliary vacuum system where uniform vacuum level, rather than low absolute pressure, is the objective.

When gas packaging is done, care must be taken in selecting a grade of gas suitable for use with food, and with a low oxygen content. The recommended grade, distributed by several manufacturers throughout the U.S. and Canada, is *water pumped high purity nitrogen.*

Barrier materials

Once oxygen has been eliminated from a package, the package itself must assume the task of barring the re-entry of oxygen from the surrounding atmosphere. Otherwise, the contents will have inadequate shelf life. The package material must have a low oxygen transmission rate, must be hermetically sealable to itself so a package can be made from it, and must be tough enough to withstand shipping and the abuse to which packages often are subjected in the display case. The best oxygen barrier materials, unfortunately, either do not



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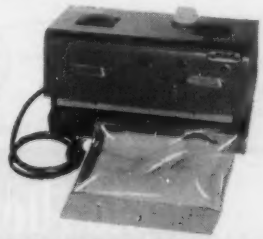
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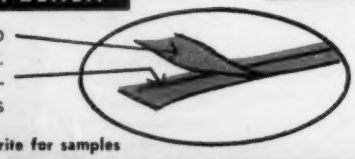
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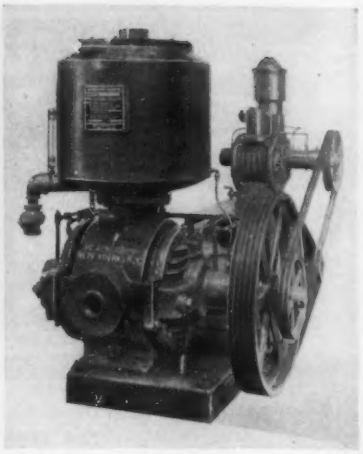


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VACUUM PUMP must be closely coupled to the packaging line. This unit supplies vacuum for packaging and for forming and then removing completed packages from high-speed machine. (*Beach-Russ machine*)

seal hermetically to themselves, or have serious mechanical defects. For this reason such materials have been laminated to nonbarrier materials which provide the mechanical and sealing properties required.

Aluminum foil has a zero oxygen transmission rate, but is occasionally subject to pinholes in the lighter gauges and will develop hair-cracks when creased or handled roughly. The severe stresses to which foil becomes subjected in the vacuum package rules it out, but it performs very well in gas packages where the inert gas serves to cushion it from atmospheric forces.

Among the popular transparent materials, saran stands out as the very best oxygen barrier of all, but it lacks the required mechanical properties for most package designs. A lamination of different types of sarans has been developed recently for the package with the two thermoformed sides mentioned previously. It combines the properties of low permeability, toughness and pressure-sensitive sealability (while still tacky)—eliminating the separate heat-sealing requirement of most vacuum packaging materials.

For most gas-barrier applications, however, saran has been applied as a thin coating to tougher films like heat-sealing polyester. This coated material may be reverse printed, if desired, before adding another, but heavier, extrusion coating of polyethylene to act as the sealant which holds the package together. This final coating sandwiches the printing, pro-

Standard Packaging lists

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reasons for dealing with an integrated packaging source

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1 Bags, film
2 Bands, paper
3 Bottle caps
4 Bottle hoods
5 Boxboard
6 Boxboard, foil lined
7 Boxes, folding
8 Boxes, setup
9 Boxwraps, paper
10 Cans, paperboard
11 Cap liners
12 Caps, disc
13 Caps, pull
14 Closures, film
15 Closures, foil
16 Closures, paper
17 Closures, laminated
18 Displays, counter
19 Displays, lithographed
20 Display-shippers
21 Drum liners
22 Envelopes, film
23 Envelopes, paper
24 Film packaging
25 Foil
26 Foil laminations
27 Hood closures
28 Inserts
29 Labels, paper
30 Labels, foil
31 Laminations, film
32 Laminations, film/foil
33 Laminations, paper/film/foil
34 Lids, foil
35 Lids, paper
36 Lids, laminated
37 Moisture-barrier materials
38 Overwraps, film
39 Overwraps, foil
40 Pails, paper
41 Papers, printing
42 Paperboard
43 Pouches, film
44 Pouches, foil
45 Pouches, laminated
46 Roll stock, film
47 Roll stock, foil
48 Roll stock, paper
49 Sheets, film
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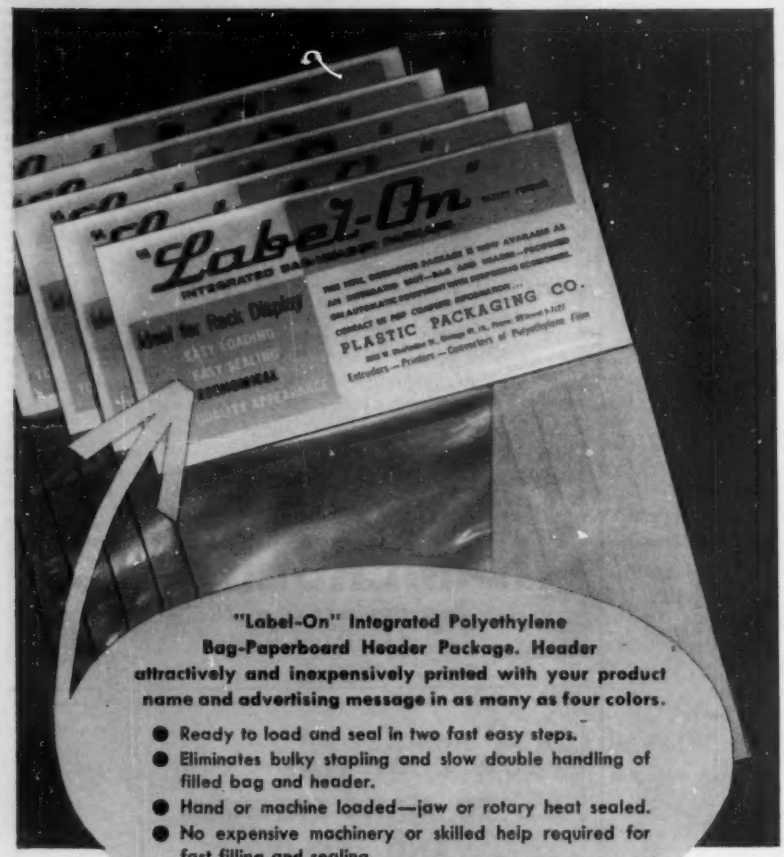
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tecting it from abrasion or contact with the food.

Saran-coated cellophane is still used in the construction of most pouches for vacuum and gas packaging and for roll stock applications not requiring a thermoformable material. For the latter, saran-coated polyester is widely used. Contenders for polyester's position in this field will be polycarbonate film,[2] and nylon film. Both have superior thermoforming properties. When the problem of bonding saran to polyethylene is eventually solved, combinations of these materials will offer maximum barrier properties at minimum cost, along with transparency and toughness.

Marketing factors

The flexible vacuum and gas packages have brought the food packer's name right into the refrigerated display case, assuring the shopper that she is getting the brand she wants. She also knows that the product has been sliced and packaged by the packer, with his rigid sanitary standards the norm. She has found out that these products come to her fresh and tasty in see-through packages, and that she may store the unopened package until she is ready to use it, as she stores other perishables.

Frankfurters now are being added to the growing list of vacuum-packaged sausage products and promise to grow into the leading volume item so packaged. Bacon, the first vacuum-packaged meat product, is awaiting a new automatic machine designed especially to handle bacon so that it may surpass even frankfurters in tonnage vacuum packaged.

Frozen foods offer another field to vacuum packaging as soon as the trend to "cook-in-the-package" gains a real foothold. Low-volume gourmet foods are now put up in pouches and have provided the first break-through, but real volume will come when ordinary frozen vegetables are vacuum packaged. Air must be removed from the package, since it will expand and burst the package upon heating. The basic machinery and materials for this package now exist, and only the marketing people remain to be convinced that the housewife will prefer to cook her vegetables in their own juice, retaining vitamins and minerals in the package until served, and have no dirty pot to clean up.

2 Film made from General Electric's "Lexan" resin.

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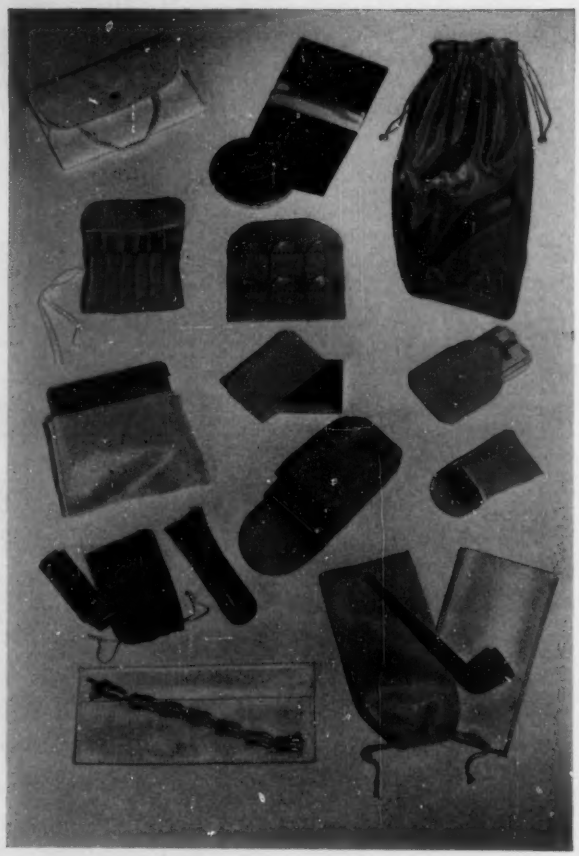
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Printed Film or Paper



Cellophane, Acetate, Pliofilm, Polyethylene, Glassine and Laminated Paper, printed in widths up to 30 inches. Gravure and Flexographic, with precision required for photoelectric controls. Also design facilities.

E-Z Pac Expansion Containers



Made to serve a variety of industries where bulk may require an expansion container. It protects the products yet brings them into clear view of the buyer. An economical transparent bag. May be heat-sealed if desired. Many weights and sizes.

Two-Piece Display Pac Container



A special purpose container designed to give its contents maximum display at minimum cost. Made by putting together two pieces of material, one transparent or translucent, the other translucent or opaque. Completely sealed by adhesives or heat. Made to order.

Protective Cushion Envelopes



Laminated padding with plain or decorated paper forms envelope container with cushioning properties. Ideal for use in optical, plastic, jewelry and polished metal industries. Can be printed. Sizes on request.

Utility Envelopes



Used extensively as counter envelopes by makers of hosiery, lingerie, cosmetics and other impulse-bought merchandise. The two-side-seam construction allows wide areas front and back, unbroken by seams, on which to print attractive designs, attention-compelling displays.

Self-Seal® Open End Envelopes



A line of containers patented by the United States Envelope Company that offers savings up to 50% in packaging due to the ease and speed of sealing. No licking, no moistening — just press down the flap to seal. Ideal for thousands of items such as souvenirs, patterns, repair kits, etc.

View-Pac Flat Containers



Made of transparent materials, View-Pac style is stocked in 22 sizes of No. 300 Plain Transparent Cellophane and made in other sizes and materials to order.

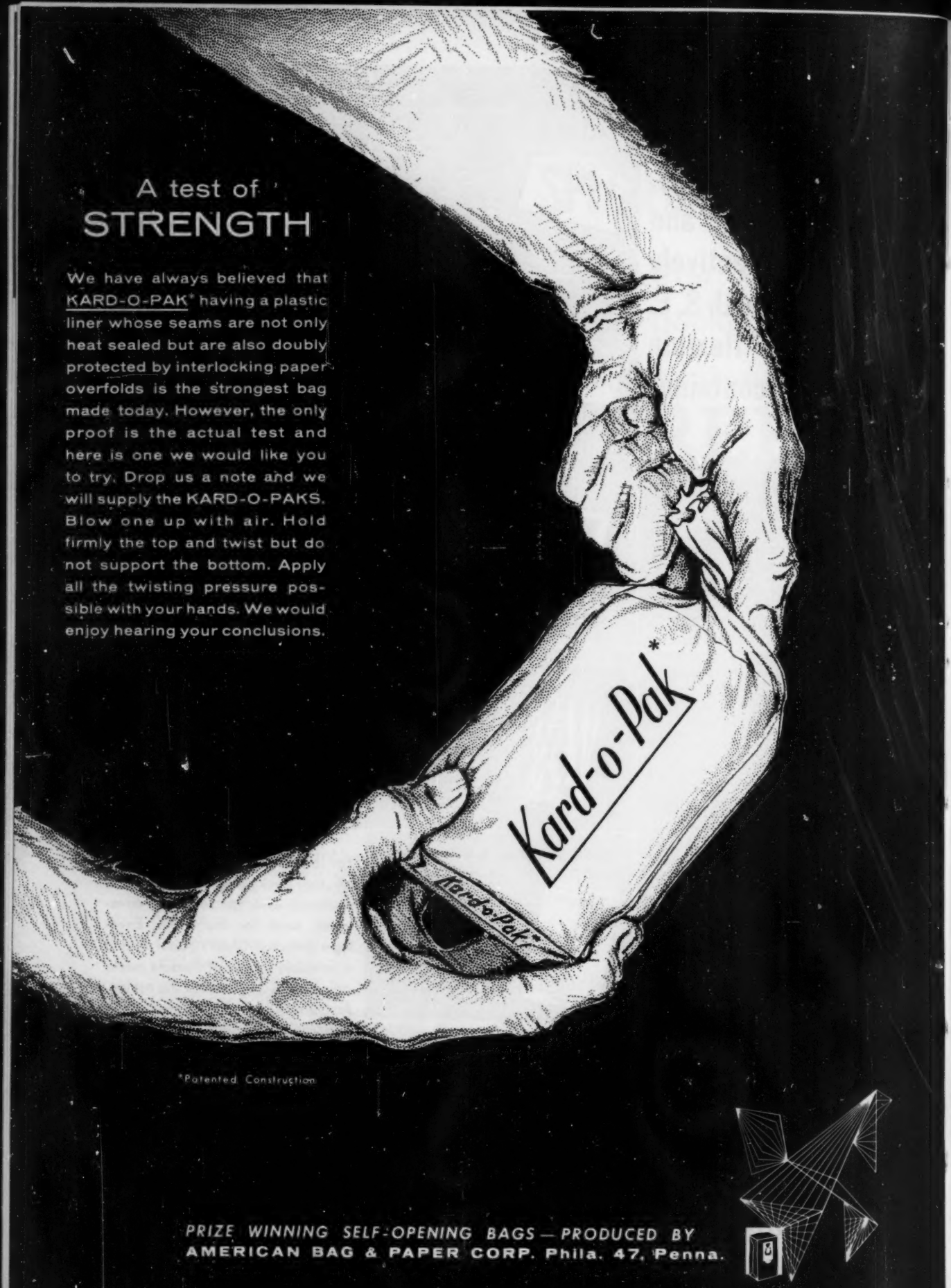
For a quick handy reference to all the packaging possibilities in standard and special duty envelopes, send for the U.S.E. Envelope Selector Chart. You'll find it a valuable source of flexible packaging ideas . . . free for the asking. Just write:

Sales Promotion Department — MPE
SPRINGFIELD 2, MASS.



USE® UNITED STATES ENVELOPE

Put your product in U. S. E. flexible packaging


A test of
STRENGTH
We have always believed that KARD-O-PAK* having a plastic liner whose seams are not only heat sealed but are also doubly protected by interlocking paper overfolds is the strongest bag made today. However, the only proof is the actual test and here is one we would like you to try. Drop us a note and we will supply the KARD-O-PAKS. Blow one up with air. Hold firmly the top and twist but do not support the bottom. Apply all the twisting pressure possible with your hands. We would enjoy hearing your conclusions.
Kard-o-Pak*
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*Patented Construction
PRIZE WINNING SELF-OPENING BAGS — PRODUCED BY
AMERICAN BAG & PAPER CORP. Phila. 47, Penna.

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Good Package Design* Stimulates Sales!

Amazing things can happen at the point of sale when your designers work with IMCO polyethylene containers. Freed from the restriction of conventional materials, they continually develop packages which overwhelm competition by the sheer magic of unusual form and color.

Thanks to advances in polyethylene chemistry, this new world of design is now available to nearly all packagers. IMCO containers are impermeable enough to hold most perfumed cosmetics, creams and household products. IMCO costs are directly competitive with glass and tin.

Surely this is the time to give your product the advantages of IMCO's knowledge and experience in the production of polyethylene containers. We can assist you in running tests of your products in IMCO containers, and we will be happy to quote prices on stock or custom-made bottles and jars. Call the sales office or plant nearest you or write direct to our Sales Manager in Kansas City. We'll have a man contact you within twenty-four hours.

*CLEAN AS A WHISTLE, PIG IN A POKE AND BOXING GLOVES BY AVON PRODUCTS, INC.

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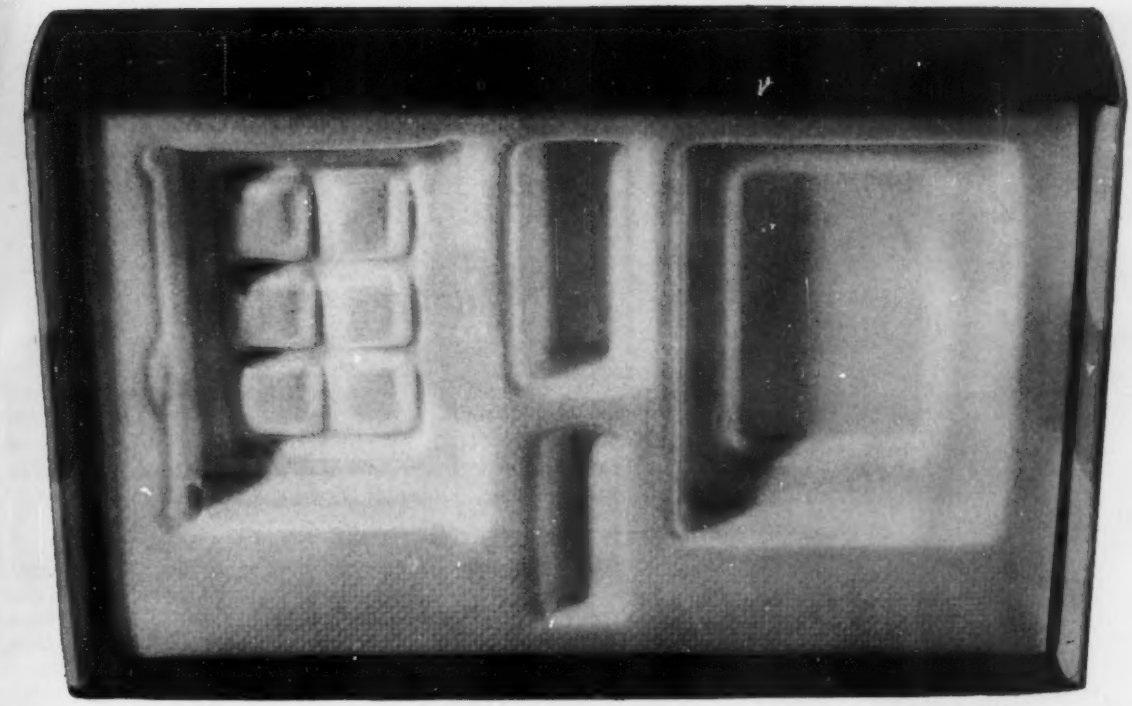
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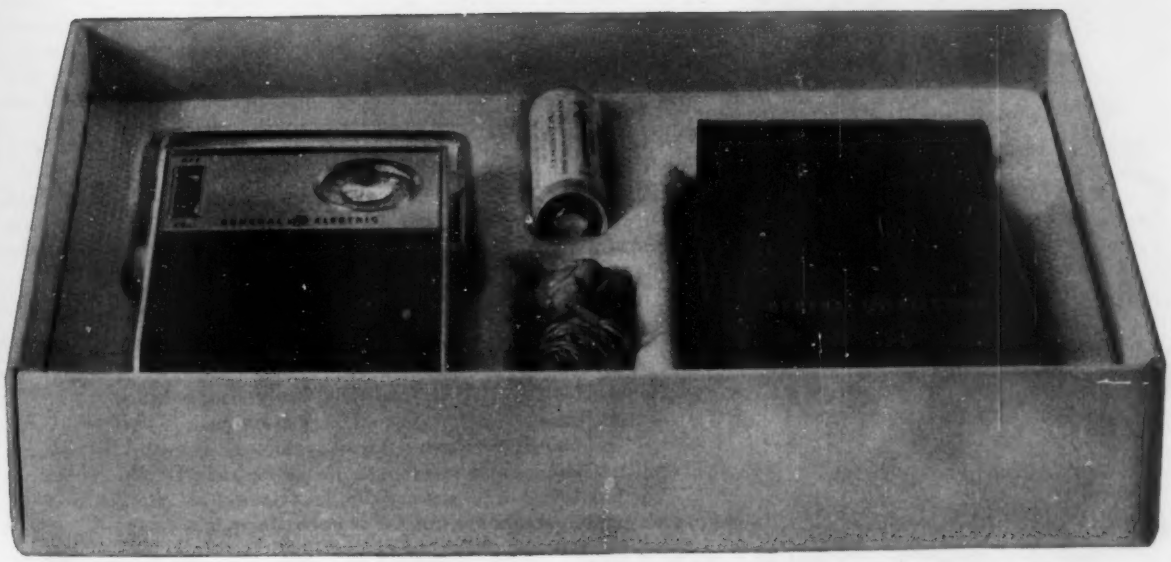
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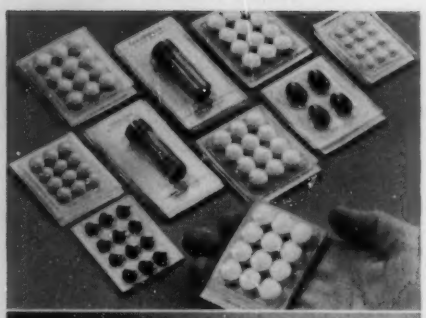




Complement your product with a XAN-NEST

General Electric did. GE's staff was in pursuit of new ways to solve old packaging problems: how to create a light-weight package with sufficient cushioning for a sensitive radio? how to create a package that is handsome both inside and out? how to create such a package and, at the same time, keep costs down? The solution: a *Xan-Nest*. A *Xan-Nest* is a formed tray, made of *Xanfoam* (extruded polystyrene foam), which is feather-light and extremely resilient. It is non-toxic, free of lint and dust, and is waterproof, grease-proof, and tarnish-proof. These trays added a fresh, clean and luxurious look to the interior of the GE package, enhancing the appearance of the smart little radio set... and they helped cut packaging costs for GE too. We would be delighted to show you how a *Xan-Nest* can complement your product. Write for details to SUN CHEMICAL CORPORATION, Dyna-Foam Division, Ellenville, New York.

Xan-Nest and Xanfoam are trademarks of Sun Chemical Corporation, Dyna-Foam Div.











Data Sheet
CAMPCO
Thermoplastic Sheet and Film

Campco Sheet and Film has demonstrated exceptional quality and dependability in thousands of applications. The data which follows indicates the characteristics and qualities of each type, enabling you to match them with the requirements of your product. If further information is desired, we shall be glad to supply it.

STYRENES

S-540 Styrene—Rubber modified rigid alloy. High impact strength and dimensional stability. Low moisture absorption, good heat resistance. Vacuum form. Gauges .010″ to .187″ stock or custom sheets. Colors, translucent or opaque. For display, toys, trays, packaging, housewares, luggage, housings, cabinets, tote boxes.

S-300 Styrene—Similar to S-540 but with greater rigidity. Good impact strength.

S-1029 Tripolymer Styrene—High impact, tensile and flexural strength at extreme temperatures. Excellent chemical resistance and dimensional stability, low moisture absorption. Forms easily, machines readily. In smooth or Haircell grain finish, gauges .020″ to .125″, many colors. For luggage, housings, chairs, ducts, exhaust hoods, clock cases.

ACETATE

A-130 Cellulose Acetate—Strong and tough. Vacuum or pressure form. Machines well. In gauges .003″ to .060″ transparent, translucent, opaque, clear and colors. For blister packs, wraps, displays, toys, novelties, indoor signs.

POLYETHYLENE

PE-200 Linear Polyethylene—Rigid, tough, heat and chemical resistant with good dielectric properties. Forms, machines, welds. Gauges .020″ to .125″ custom sheets and rolls. For housewares, containers, vessels, electrical products, toys, housing, packaging.

PE-100 Low Density Polyethylene—Low melt viscosity, excellent chemical and heat resistance. Stable under humidity changes. Vacuum form. Processes rapidly. In gauges .015″ to .125″ gloss finish custom sheets and rolls. For housewares, packaging, toys, containers, form liners, electronic applications.

POLYPROPYLENE

PP-300 Polypropylene—Impervious to stress cracking. Excellent dielectric properties, chemical resistance, rigidity, strength. Heat resistant to 300° F. Low specific gravity. Gauges .010″ to .250″ custom sheets and rolls, variety of colors. For chemical ducts and vats, fittings, electrical parts, sterile items.

Campco engineers will gladly work with you on any problem involving the use of these materials. Write or phone today. There is no obligation.

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package almost anything . . . better

with

BAKELITE® Plastics

from UNION CARBIDE

Materials Especially Engineered for . . .

Bags • Overwraps • Coatings • Bottles • Closures • Rigid Containers • Skin Packages



BAKELITE® Plastics:

● **BAKELITE® Polyethylene** can be molded into rigid and flexible containers or extruded into film, coatings, tubes, or sheet for vacuum forming. Low-, medium-, and high-density polyethylenes are available to meet a variety of packaging requirements. You can get toughness and flexibility over a wide temperature range . . . high moisture and chemical resistance . . . excellent rigidity . . . light weight . . . and economy.

● **BAKELITE® Vinyl** is widely used in the molding, extrusion and calendering of flexible, semirigid and rigid packages and packaging materials. Vinyl has high resistance to acids, chemicals and mechanical abrasion . . . comes in a full range of transparent, translucent, and opaque colors. For specialty packaging, there is BAKELITE rigid vinyl sheeting and KRENE cast vinyl film.

● **BAKELITE® Styrene** offers complete transparency, gloss and color range. Available as both molding and extrusion compounds having a wide choice of impact strengths. C-11 copolymer has chemical inertness . . . is a natural for many types of detergents, soaps, and essential oils used in today's products.

● **BAKELITE® Phenolic** closures have been the standard of the drug, cosmetic, and liquor industries for years. Offer great rigidity and dimensional stability. Provide a rich, lustrous finish that resists abrasion. New fast-curing compounds are bringing greater economies to high-speed automated production.

1 Subscribers receive magazines unmarred when they are mailed in polyethylene film wraps . . . publishers reduce packaging costs.

2 Carboy of high-density polyethylene is light, unbreakable, chemically inert, low in cost.

3 Impact styrene made this can clip possible . . . a revolutionary idea in six-packs.

4 Paper pouches coated with polyethylene or vinyl are heat sealable, strong, and moisture resistant.

5 Superior protection against moisture penetration plus excellent clarity, sparkle, and printability are features of this polyethylene film package for sugar.

6 Metalized closure of phenolic has high-fashion looks at low cost, rigidity, torque strength.

7 Nozzle closure, giving flip-open convenience, made of special polyethylene for dimensional stability.

8 Two separate components, one of high-density polyethylene, the other of copolymer styrene (C-11), made this safety cap a practical reality.

9 In this roll-on deodorant package, high-density polyethylene provides dimensional stability, strength.



Key to better packaging

10 Low-density polyethylene gives this squeeze bottle flexibility, light weight, low cost.

11 Detergent bottle, of high-density polyethylene, is non-breakable, resists stress-cracking, is light, colorful, economical.

12 High-density polyethylene gives this bleach bottle new lightness (1/10 weight of glass), color range, unbreakability, economy.

13 Impact styrene makes this newly designed tape dispenser rugged, gives it see-through translucency.

14 Phenolics give this closure torque strength, dimensional stability, and a satin sheen.

15 Water-clear transparency, high rigidity is obtained from styrene in this cosmetics container.

16 Polyethylene provided color range and design freedom in making this aerosol closure.

17 Skin packaging with polyethylene or vinyl film provides safe shipment of fragile industrial products, greater self-service selling power for consumer products.

18 Styrene is the designer-decorator's choice for this powder box, which has gloss, rigidity, printable surface.

19 Ice cream container of "low-oriented" impact styrene has a combination of see-through translucency, economy, high strength, even at low temperatures.

20 Milk cartons are coated with polyethylene, vinyl or polyethylene-wax blends to prevent leakage and scuffing and provide a handsome appearance.

21 The unique toughness and moisture-gas transmission properties of polyethylene film account for its outstanding success in packaging citrus and other fresh produce.

22 Paper-film-foil combinations for dehydrated foods use either polyethylene or vinyl coatings to give heat sealability, plug pinholes . . . guard freshness.

23 Either styrene or low-density polyethylene can be used for this aerosol seal, giving tamper-proof protection to the new package.

24 Bottle caps made of rigid vinyl sheeting can be snapped on and off many times without losing shape.

25 Tray packs of candy, baked goods and other food products have long shelf life, resist transit damage when wrapped automatically in economical polyethylene film.

26 Paperboard cartons and trays for baked goods are more attractive with a glossy grease-resistant coating of polyethylene or polyethylene-wax.

27 Polyethylene overwraps are ideal for paper products because they won't split or dry out in storage or on dealer shelves . . . and they cost less than other transparent wrapping materials.

28 The low temperature toughness and impact strength of polyethylene film make it a natural for frozen food packaging.

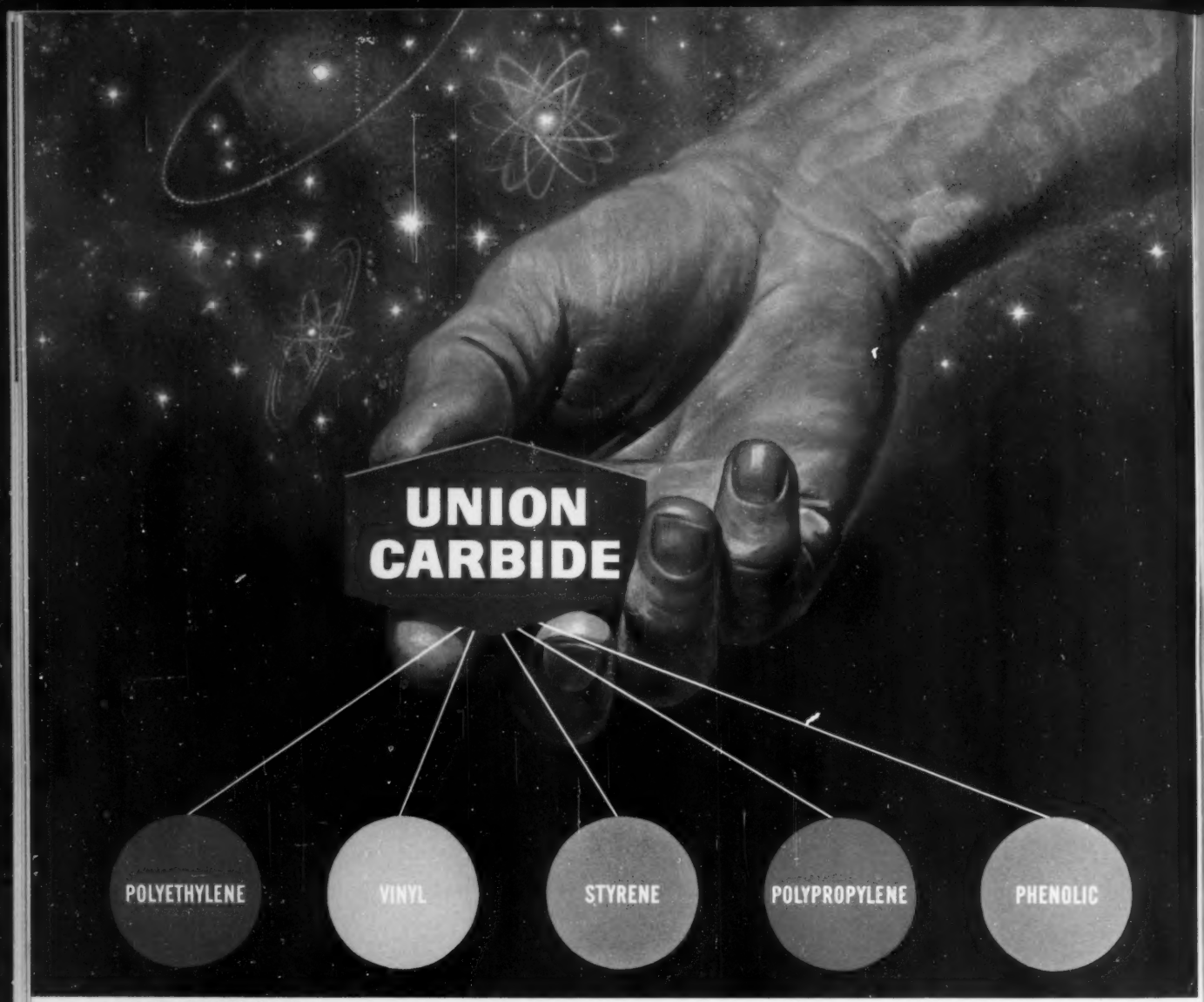
29 Polyethylene bread wraps are "soft to the touch," help keep bread fresh by reducing moisture loss.

30 Polyethylene-coated cellophane and other films gain heat sealability, added strength and moisture resistance. Excellent for packaging wet, dry or frozen foods.

. . . and NOW from Union Carbide

BAKELITE® Polypropylene

Look for New Dimensions in Plastic Packaging



...for Packaging with Plastics

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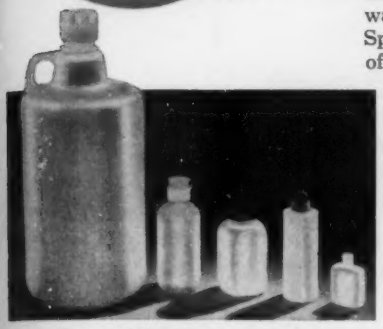
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Get acquainted with ERNO for

plastic bottles • jars • vials • carboys

Erno wholesale distributors for leading manufacturers of plastic and glass bottles, molded plastic, metal and polyethylene caps and all types of corks—offers you quick, reliable service. You'll find the items you want—obtainable without delay from extensive stocks at Erno. Special Note: Erno Products Company warehouses the entire line PLAX® of polyethylene containers.



POLYETHYLENE BOTTLES

Round, from ¼ oz. to 13 gal. Oval, oblong, square. Narrow and wide mouth in light and regular weight. New low cost high-density polyethylene containers. Natural color—immediate delivery. Colored bottles—imprinting and decorating service.



CAPS and CLOSURES

Sprinkler, plug, spout caps and all type fitments. Phenolic, urea, polyethylene and metal closures.



PLASTIC RIGID CONTAINERS

Threaded, shoulder, shell and beaded vials; rigid jars. Screw cap, slip-on, snap, plug or sifter closures. Shatterproof, reusable, odorless in clear, opaque, amber or green colors. Sizes 1½ drams to 1 gallon.

ALSO AVAILABLE:

Polystyrene, acetate, rigid wide-mouth jars from ½ oz. to ½ gal. . . . polyethylene tanks and faucets . . . funnels . . . measures . . . acid pails . . . jugs . . . for additional information, refer to our ad on page 385, in the Glass Packages, Closures, Caps Section.

Write, wire or phone—for prompt, courteous service.

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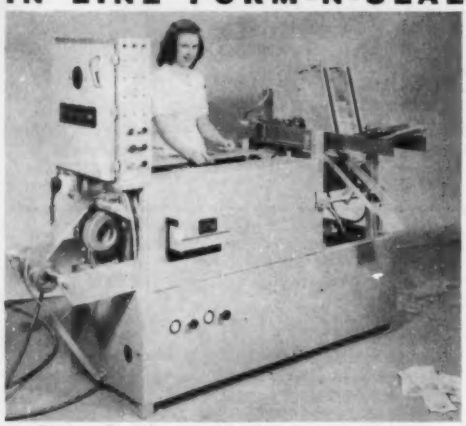
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ATLAS VAC-MACHINE CORPORATION

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Vlchek Model P-824
24 compartment, clear plastic box
one of largest compartmented boxes ever molded

If you require plastic boxes for packaging your products . . . or for use in plant and office operations, see Vlchek.

Vlchek, pioneer plastics manufacturer, stocks boxes in 30 standard sizes . . . ready for immediate shipment. These are available in 1,000 compartment arrangements . . . crystal clear, tinted transparent, or solid colors. Complete imprinting service.

Or, if you need a special box of any type or shape, Vlchek will design and custom-manufacture it. Write us today. Our representative will call promptly. AA-6913

The **Vlchek** *Tool Co.*

SINCE 1895

Cleveland 4, Ohio

Big news in packaging is plastic containers!

Be the first in *your* markets to switch to plastic—the ideal packaging material!

ADVANTAGES OF PLAX PLASTIC CONTAINERS

- **Functional Design**—PLAX designs containers, applicators and closures to provide your products with *unique* consumer appeal. A functional plastic container will make your product easier to use...easier to remember!
- **Visual Appeal**—PLAX containers are designed to be beautiful as well as efficient. They can be styled and molded in shapes impossible to obtain in glass or metal. Many manufacturers have selected PLAX-designed plastic containers because of their favorable *size impression.* Colors can of course be molded right into the container!
- **Versatility**—PLAX molds plastic containers for *hundreds* of different products—from many types of plastics. *A plastic container can be created for most products to meet specific requirements for strength, shelf life, permeability, etc.* Internal bottle linings are provided for special applications.
- **Unbreakability**—PLAX containers are unbreakable. If you package in glass, you can save on breakage losses and eliminate the hazard to the consumer by switching to plastics. Likewise, PLAX containers are not easily scratched or dented.

PARTIAL LIST OF POSSIBLE PRODUCT APPLICATIONS

High Density P/E Containers

Ammonia
Baby Nursers
Beauty Aids
Bleaches
Bluing
Bowl Cleaners
Cosmetics
Fabric Softeners
Germicidal Cleaners
Hair Preparations
Industrial Acids
Lotions
Photographic Liquids
Polishes & Waxes
Rubbing Alcohol
Shampoos
Starches
Sun Tan Lotions
Toiletries
... and others

Conventional P/E Containers

Battery electrolyte
Cosmetic Lotions and Liquids
Deodorants, personal
Detergents
Ear Drops
Eye Drops
Enema Solutions
Household Glues
Nasal Sprays
Room Deodorants
Shampoos
Shaving Lotions
Suntan Oils & Lotions
Throat Sprays
Topical Lotions

Alcohols
Bleaches, Industrial
Chocolate and other syrups
Chromic Acid under 40% (specific products should always be tested)
Cleaner, Metal, Phosphoric Acid Compound with Wetting Agent
Cleaner, Muriatic Acid Base
Fluoboric Acid
Formaldehyde
Formic Acid
Hydrobromic Acid
Hydrochloric Acid
Hydrofluoric Acid
Hydrofluosilicic Acid
Hydrogen Peroxide 3% and 30% (Requires venting)
Muriatic Acid
Nitric Acid to 10%
Phosphoric Acid
Polyvinyl Acetate Emulsions
Potassium Hydroxide Solution
Quaternary Ammonium Compounds
Sodium Hydroxide
Sulfuric Acid up to 93% (over 60% will darken on long storage)
Vanilla Extract
...and others

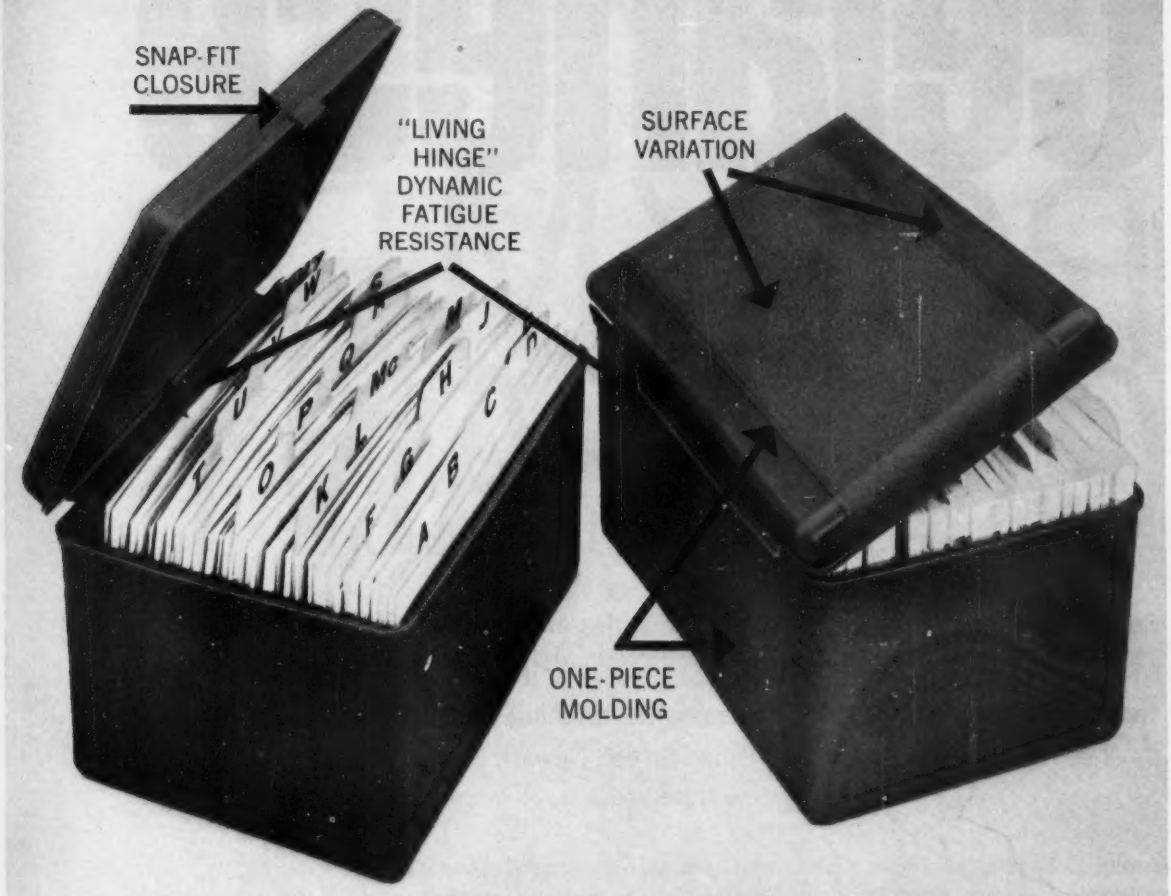
This is a partial listing for your guidance. We suggest you discuss with us the compatibility of your products for plastic packaging.

Why not investigate the possibilities of packaging *your* products in plastic containers? We have a complete line of stock containers to suit most requirements, or our Design Department will work with you to develop a new custom container. Write to Department D, Plax Corporation, P.O. Box 1019, Hartford 1, Conn.

PLAX CORPORATION, HARTFORD 1, CONNECTICUT

PLAX®

WHAT'S NEWS IN PLASTICS



File box with "living hinge" shows design versatility of Escon® polypropylene

A "living hinge" with extraordinary life, snap-fit closures to replace metal parts, various surfaces—gloss, matte or textured—these are just three of the countless design possibilities when you mold with versatile Escon polypropylene. Testing of "living hinges" was discontinued after 1,300,000 flexes without signs of weakening.

Escon polypropylene offers molders a balanced combination of properties for high-speed, continuous production. These include resistance to acids, alkalies and corrosion; high strength; low volume cost; negligible water pick-up; high heat distortion point; excellent electrical characteristics; abrasion resistance; easy processing and many more. For technical assistance, write to Enjay at 15 West 51st St., New York 19, N. Y.

EXCITING NEW PRODUCTS THROUGH PETRO-CHEMISTRY

ENJAY CHEMICAL COMPANY

A DIVISION OF HUMBLE OIL & REFINING COMPANY

ENJAY
PLASTICS

celanese
POLYMER COMPANY

Celanese has the interest, technical capabilities and experience to help you use its wide variety of plastics to best advantage in packaging materials. For full information on any or all of these plastics, please write, outlining your specific application, to: Celanese Polymer Company, 744 Broad Street, Newark 2, N. J.

FORTIFLEX . . . a complete range of polyethylenes from .915 to .960 density. Ideal for blow molded bottles, sheet and film.

FORTIFLEX A . . . linear polyolefins. This series of resins gives the ultimate stiffness necessary to achieve the thinnest rigid walls for minimum product weight . . . as well as excellent resistance to permeation. It offers particular advantages in the blow molding of such packages as bleach bottles. Fortiflex A resins are available in both colored and natural molding powders.

FORTIFLEX B . . . linear copolymers. Slightly lower in density than the A series, Fortiflex B50 resins offer greater resistance to environmental stress cracking and are particularly suited to blow molding detergent bottles and allied applications. Available in both colored and natural molding powders.

FORTIFLEX C . . . medium density polyethylenes. Midway in stiffness between the softer type low density polyethylenes and the rigid type Fortiflex A and B resins, Fortiflex C is available in formulations for blow molding, paper coating and extrusion. Available in natural.

FORTIFLEX D . . . low density polyethylenes. Available in a range of densities from .915 to .924 and in a variety of melt indices. It provides a line of resins ideal for blow molding, injection molding, extrusion of film and paper coating. Resins range from the moderately stiff materials at the top of the range to the softest low density polyethylenes commonly in use today. Available in natural.

plastic raw materials for blow-molded and other types of packages

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FORTICEL Cellulose Propionate—the best combination of properties of all cellulosics is found in Forticel. It is free of objectionable odor and particularly well suited for blow molding because it offers higher impact resistance and strength than high density polyethylenes in this application . . . is rigid and shatter resistant. Specific formulations available, formulated entirely of F D A acceptable material for use in contact with watery foods.

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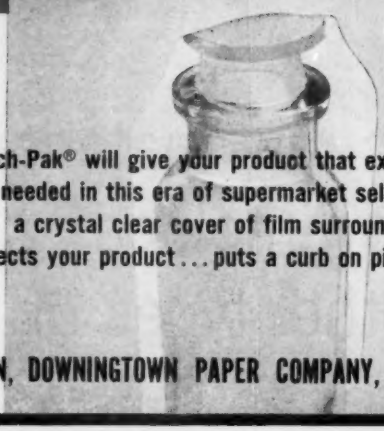
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SECTION 8

PLASTIC PACKAGES—MOLDED AND SHEET

Progress in plastic packages

by D. P. Meiklejohn*

The plastics area is an extremely rewarding one in which to prospect for new packaging ideas and advantages. There are many different families of plastics with which to work and, each year, new and improved types are introduced.

Among the plastics coming in for increased attention are medium- and high-density polyethylene, polypropylene, nylon and "Delrin" acetal resin. These materials offer new opportunities for improved or more economical containers and closures. (See also the article on plastic bottles, jars and tubes in this section, and on closures in Section 10.)

Some of the most impressive gains that plastics are making from the packager's point of view involve foamed plastics. Broad packaging progress is being made both with fabricated and with molded foams. (See also the article on foamed plastics in this section.)

A significant and continuing development is the downward trend of plastic resin prices, especially in view of the continuing rise in the cost of other packaging materials. Equally important to the packager is the successful "marriage" of plastics with other materials—resulting in containers better able to meet complex protective and merchandising requirements.

Important in current developments are the effects of Federal legislation and its influence on food and cosmetic packaging. The Food Additives Amendment of 1958 to the Food, Drug & Cosmetic Act of 1938 has made the selection of plastic more exacting for certain applications. Plastic components of the package are subject to the law unless it can be shown to the F&DA's satisfaction that no migration of ingredients takes place. This holds true for both the basic raw material and any stabilizers or colorants used.

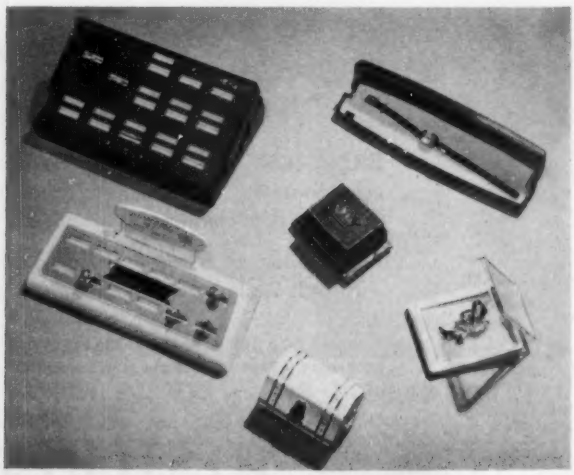
Until recently, high temperatures of steam sterilization have limited the use of otherwise suitable plastics in certain packaging applications. New sterilization techniques utilizing ethylene oxide permit plastics to replace glass or metal in drug containers and other hospital packages.

It has been said that the future of plastics packaging "lies in the trash barrel"—in other words, in disposable packages. The recent trend toward disposable containers for coffee, ice cream, salads and razor blades certainly bears out this prediction. Reusable plastic containers require extra strength which calls for more or higher-cost materials. Obviously this would not be consistent with the trend toward unit cost reductions.

*Technical Service, Plastics Div., Monsanto Chemical Co., Springfield, Mass.



QUALITY look of plastic containers can be silent salesman for food products. Candies, nuts and cheeses are conveniently served at the table from original packages. (*Plastic Food Container Assn.*)



STOCK BOXES of molded polystyrene, available in range of shapes and colors, have become an essential for jewelers in adding counter appeal to their products. (*Koppers Co., Inc., photo*)

Plastic coatings are a major area remaining to challenge the packaging industry. Some modified or alloyed plastics are available today. However, a great deal more are still under development. Since metals and paper are presently being combined, why not plastics? Perhaps with suitable coatings it may be possible to mold lightweight, attractive plastic containers which can hold a vacuum.



MOLDED ACETAL aerosols are expanding the design possibilities for perfume and cologne packages. Almost limitless variety of shapes that can be molded has earned welcome from fashion field where change is keynote. (*Du Pont photo*)

Standard types

Plastics used for molded containers of the thermoplastic type are: general-purpose styrene; high-impact (rubber-modified) styrene; polyolefins, including polyethylene in a range of types and densities and polypropylene; cellulose acetate; cellulose acetate butyrate and acrylics. The large use of thermosetting materials such as phenolics, ureas and melamines is for closures. Selection for a particular application depends on:

1. Unit material cost of molded container. (See cost tables, p. 16, and p. 289.)
2. Chemical resistance properties.
3. Physical properties (including strength, water-vapor transmission and gaseous permeability).
4. Transparency or color.
5. Methods and ease of fabrication.
6. Toxicity (in food packaging).

Sheet and various other plastic containers are discussed in separate articles that follow. For plastic shipping containers, see p. 698.

A chart, "Characteristics of Molded Plastics," which follows this article provides a general discussion of color range, chemical resistance, impact strength and typical uses for each.

Styrene plastics—general purpose and rubber-modified—continue to find widest acceptance and growth for injection molding of packages.

A relatively new growth area for rubber-modified styrene is vacuum and pressure forming of extruded sheet. Hot and cold drink cups, disposable ice cream sundae dishes, and containers for salads and cottage cheese are among the many end uses.

General-purpose styrene is available in an unlimited range of colors, and also a water clear. Tougher rubber-modified styrenes are now obtainable in translucent colors, opaque colors and also in a natural color (slightly milky-white, highly translucent polymer). The increased clarity of the rubber-modified styrene is an important development.

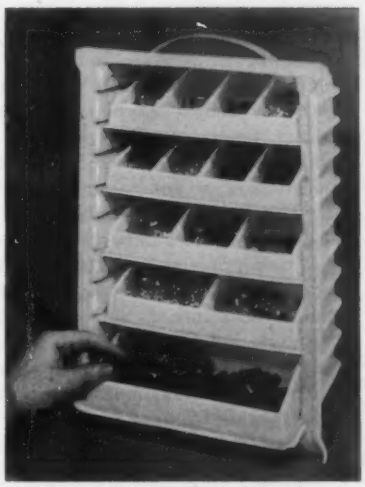
Styrene is low in cost, has low specific gravity and excellent dimensional stability and is relatively simple to injection mold. It is resistant to most foodstuffs, but tests for resistance to possible chemical attack are recommended. Grades with special heat-resistant properties up to 215 deg. F. can be obtained, including some that can be boiled.

Polyethylene has grown widely in acceptance and become competitive to styrene in many thin-wall container and lid applications. It is a semiflexible, highly durable material; has low water-vapor transmission rates and possesses excellent chemical resistance and strength properties for (1) dispenser-type packages like blow-molded squeeze bottles and cans, (2) injection-molded, re-usable, nonbreakable containers and (3) certain applications in industrial packaging.

Because polyethylene has excellent flexibility and can be molded with ease, it has been possible to mold hinges and thus to eliminate costly mold design and post-molding.

High-density polyethylene has improved properties including greater tensile strength. Good low-temperature properties are creating considerable interest in its use for frozen-food packaging. A maximum use temperature of 250 deg. F. indicates that steam-sterilized polyethylene containers are practical.

Polypropylene. Although certainly out of its infancy, this polyolefin still only shows promise as a large-scale packaging material. With a low density (0.90) and projected price decreases in material, polypropylene is still expected to be a comer. Its good strength, moldability, rigidity, and chemical resistance have found good acceptance in molded closures.



TOUGH, PORTABLE assembly line parts station consists of compartmented bins and a carry case formed from high-density polyethylene. (*W. R. Grace & Co. photo*)

Cellulosics are noted primarily for wide color range, mechanical strength and toughness. They are used mainly where impact strength is of prime importance. Butyrate or ethyl cellulose is preferred over cellulose acetate where dimensional stability is required. Cellulose acetate has excellent low-temperature properties.

Phenolics are compression-molding materials and it should be noted that, as a plastic, they possess a low cost per pound. Their color range is limited to dark colors. Phenolic is little used in making packaging containers because of its dark color and high specific gravity. It is, however, used for closures.

Melamines normally are restricted



MOISTUREPROOFNESS is added to transparent molded box by sealing with metalized tape which is easily removed. (*Minnesota Mining & Mfg. Co. photo*)

to use for closure applications because of their higher cost. They do possess excellent flexural strength and shock resistance and also lack odor and taste. They are compression-molding materials and are available in limited opaque colors.

Urea is a compression-molding, chemical-resistant material available in a wide range of colors. It has excellent resistance to common solvents, alcohols and essential oils. It is nonelectrostatic and does not attract dust. This material has excellent surface hardness and abrasion resistance and is used primarily in higher-priced packaging when luxury appeal or chemical resistance is important. A well-known branded product for the relief of colds uses a molded urea inhalator successfully, and similar uses can be considered.

Acrylics. In general, acrylic resins are characterized by excellent appearance qualities, dimensional stability, resistance to outdoor weathering, and chemical resistance. Improved heat-resistant formulations are available. These tolerate brief immersion in boiling water and are resistant to temperatures up to 195 deg. F. Because of relatively high cost, acrylic is best used in luxury packaging.

Cost considerations

The cost of a molded plastic package depends on the following factors:

Custom or stock design. Strictly speaking, perhaps, there is no substitute for a package that is custom designed for a product. Nevertheless, in situations where promotional timing or marketing-budget limitations preclude adoption of an exclusive package, choosing available stock-molded packages and using post-mold treatments are practical.

Mold cost. Plastic molds are precision tools requiring the best materials in order to maintain exact dimensions and to resist pressures between 10,000 and 20,000 p.s.i. As such, these tools are expensive, with $5,000 to $15,000 not uncommon prices.

In general, injection molds are more expensive than compression molds and lend themselves to considerably more detail. The manufacturing cost of an injection-molded item is generally lower and offsets higher mold cost on longer runs. Complex designs increase mold cost. However, where sufficiently long runs are involved, detailed designs may be had at negligible increase in unit cost.

Increased interest is being shown at present in the use of smaller automatic machines running relatively inexpensive dies. A number of small automatic machines are currently on the market and, as these are improved, they will become a major factor in expanded use of molded containers.

Material requirements. Material selections will be based primarily on physical and chemical-resistance requirements and will determine the method of manufacture and, consequently, affect final cost.

Molding material cost as a percentage of finished package cost with post-molding operations can be roughly figured at 50% of total.

Design principles

When custom-made containers are desired, work with competent mold makers, molders and suppliers.

Injection molding. This process consists of forcing a heated, viscous thermoplastic material into a closed die under actual pressures varying between 3,000 and 7,000 p.s.i. Thermoplastic materials are such that scrap and rejects may be reground and remolded under proper conditions. When considering design for injection molding, careful attention must be given to the type of material to be used.

1. Draft or taper should be a minimum of 1 to 2 deg. per side for all materials except polyethylene which should be 2 deg., minimum.
2. Maintain uniform wall sections throughout piece, usually in the range of 0.040 to 0.080 in. thick, although thin-walled containers have been molded as low as 0.015 inch.
3. Use restricted gating where possible; center gating for strength.
4. Avoid sharp corners by providing ample radius. A 1/32 in. minimum radius is suggested.
5. Where hinges are involved, molded-in type (ball and socket) will reduce cost. In flexible materials such as polyethylene, the cover and the base can be molded as a single unit.

Compression molding. This process consists of molding a preformed or pre-weighed charge of material under heat and pressure to the shape of a die. Primarily used for phenolics, ureas and melamines, this process will not permit re-use of scrap once the resin has been cured. Again, specific details for design will vary with each compound.

1. Avoid undercuts (unless special cam or air-operated devices are to be provided).
2. Minimum draft is ½ deg. (preferably 1 to 2 deg.).
3. Maintain uniform wall sections throughout piece, usually in the range of 0.062 to 0.080 in. thick.
4. Avoid sharp corners.
5. For boxes, pin hinges or Rathbun-type, special clip hinges are normally used.



RE-USABLE beer case is injection molded with integral hinges and lid, in one piece, from high-density polyethylene for long life. (*Koppers Co. photo*)



WELDING powder used under outdoor conditions is kept dry in sturdy, molded high-density polyethylene box which is tape sealed. (*Eastman polyethylene*)

Characteristics of molded plastics

*Type of material and general characteristics**	*Packaging uses*
ACRYLIC (methyl methacrylate). All colors, most commonly in colorless transparent, with unsurpassed brilliance and clarity. More durable luster than styrene. Excellent dimensional stability and outdoor exposure stability. More flexible and less brittle than styrene, although not so tough as cellulosics. Adequate heat resistance (160-180 deg. F.). Excellent odor and taste characteristics. Excellent resistance to dilute acids, alkalies and alcohols. Affected by lower ketones, esters, aromatic hydrocarbons, strong acids and alkalies.	Transparent molded boxes for cosmetics, jewelry and small products. Displays.
CELLULOSICS (cellulose acetate, cellulose acetate butyrate). Complete range of fast colors and clear transparent. High surface luster. Moderate resistance to scratching. Fair to good dimensional stability. Tough. Shock resistant. Moderate flexibility. Adequate heat resistance for most packaging uses. Highest service temperature about 200 deg. F. Very good machinability. Cements easily and can be lacquered. Resistance to most oils, greases, weak acids and weak alkalies. Poor resistance to organic solvents. Good resistance to most hydrocarbons, poor to lower alcohols, ketones and esters.	Jewel boxes, containers for dry products and hardware; closures and display components. Tubes and vials. Caps for aerosols.
MELAMINE (cellulose filled). Color range includes all whites and pastels (lightfast) in opaque and translucent. No crystal. Excellent luster. Good dimensional stability. Low water absorption. Strength comparable to phenolics. High torque; good shock strength. Heat resistance 210 deg. F. Excellent taste and odor characteristics. Excellent resistance to alkalies (much better than other compression materials), very good resistance to oils, greases and organic solvents. Good resistance to weak acids.	Closures, jewelry boxes, cosmetic containers, displays -- where requirements are more stringent than those met by urea. Aerosol containers.
PHENOLIC (wood flour filled). Dark opaque colors; lighter colors tend to discolor. Luster good but not so high as thermoplastics; fair to good resistance to scratching. Excellent dimensional stability and low shrinkage. Lower water absorption than thermoplastics except styrene. Excellent mechanical properties, high rigidity, high torque strength. Heat resistance better than any other packaging plastics. Formulations available with minimum taste and odor. Excellent resistance to alcohols, petroleum, weak acids; poor resistance to alkalies.	Closures for bottles, jars and collapsible tubes. Re-use boxes. Displays for small items.
POLYETHYLENE. Translucent and colors. Range of densities gives range from flexible to more rigid types. Excellent dimensional stability and chemical resistance. Very low water absorption and no attack by alkalies, most acids or common chemicals below 140 deg. F. Natural resin is odorless, tasteless and extremely tough, with brittle temperature below —70 deg. F., and remaining inherently flexible over wide temperature range. Service temperatures of 185 to 250 deg. F., without warpage or distortion. Newer, higher densities offer improved properties, but may lack some of the desirable properties found in conventional polyethylene.	Bottles, jars, tubes, carboys, contour-shaped containers. Squeeze cans. Closures, dip tubes, dispensing devices, lids.
POLYPROPYLENE. Complete range of opaque and translucent colors. Matte or gloss finish. Good scratch resistance. Lowest specific gravity of any commercial plastic. Excellent dimensional stability up to 300 deg. F. Mold shrinkage 0.015 to 0.025. Water absorption very low. Excellent odor and taste characteristics. Highly resistant to most alkalies, acids, common chemicals.	Closures and containers, especially where styling plus function is important.
POLYSTYRENE. Complete range of colors, including transparent. Clarity superior to other plastics except acrylic. High-luster surface, easily scratched. Usually considered somewhat brittle. High dimensional stability, negligible water absorption. Tensile strength is high but has little "give" when stressed or shocked. Adequate heat resistance (about 170 deg. F.) for most packaging uses. Virtually complete freedom from taste and odor. Unaffected by common acids, alkalies and alcohols. Poor resistance to petroleum derivatives and certain essential oils. Three types. See ASTM specification D-703-56T.	Cosmetic containers, acid bottle closures, crystal boxes for small parts, general-purpose injection applications. Compartmental boxes, hinged boxes.
POLYSTYRENE MODIFIED (high-impact alloyed polystyrene). Complete range of opaque and translucent colors. Surface available in matte or gloss finish. Will scratch fairly easily. Low specific gravity. Excellent dimensional stability. Very low water absorption. Adequate heat resistance (180 deg. F.) for most packaging. Becomes brittle at low temperatures. Excellent odor and taste characteristics. Unaffected by common acids, alkalies and alcohols. Poor resistance to petroleum derivatives and organic solvents. Approved for contact with fresh meats.	Disposable food containers, produce trays and baskets. Cosmetic packages. Displays. Package components.
UREA (cellulose filled). Colors include all whites and all shades (lightfast) in opaque and translucent. No crystal. Excellent luster, comparable to thermoplastics. Good dimensional stability. Will not soften on exposure to heat. Strength properties good. High rigidity. Heat resistance (170 deg. F.). Excellent taste and odor characteristics. Good resistance to alcohols, oils, greases and weak acids. Poor to fair resistance to alkalies.	Closures, especially for cosmetic and personal product containers, where appearance is important. Jewelry boxes. Displays.

*Manufacturers of these materials are listed in the Buyers' Directory at the back of this book under "Plastic Molding Materials." Also consult articles in this section for additional information.

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DESIGN AND DECORATIVE possibilities with high-density polyethylene bottles highlighted by these uses for industrial cleaner and liquid detergents. (*Plax Corp. photo*)

Plastic bottles, jars and tubes

by E. J. Temple* and F. L. Bracy*

The plastic bottle industry has taken its place as one of the major segments of the packaging field. The uses of conventional low-density polyethylene squeeze bottles have continued to grow in number, with new applications in the cosmetic, toiletries and pharmaceutical fields.[1] The greatest factor in the growth of the industry, however, has been the trend of household-chemical manufacturers to switch from their traditional packages to new, attractive high-density polyethylene containers for such products as liquid detergents, bleaches, fabric conditioners and polishes. This change in packaging concept has helped bring about a 100% increase in the annual production of plastic bottles and tubes over the past 2 years.[2]

Bottles can be made of practically any thermoplastic, but three kinds of containers are of greatest commercial importance: low-density polyethylene (0.92 density); high-density polyethylene (0.94-0.96 density); and lined polyethylene, which generally is low-density polyethylene film internally lined with a dissimilar polymeric material.

The characteristics and the economic relationship of the various materials have been reported in detail. (See charts pp. 16 and 272). Specific applications are described below.

Regular, or low-density, polyethylene bottles have been widely used for years because of their appearance, utility, flexibility and safety. A popular size low-density polyethylene container is the 4-oz. oval container. It costs about 4 to 5 cents without decoration or closure. Products commonly packaged in bottles of this type include shampoos, deodorants, nasal sprays, eye drops, suntan lotions, hair neutralizers and acids. New items of particular interest are custom bottles for shoe polishes[3] and special roll-on containers. Literally hundreds of stock bottle molds are available for the user who does not require custom molds. Further, dozens of fitments to produce dropper, spray, and dispenser packages are available as stock mold items. But low-density polyethylene no longer dominates the list of plastic bottle materials.

High-density polyethylene bottles[4] have increased enormously in use since their introduction just a few years ago, and now account for a larger percentage of the industry than their low-density counterpart. There are many reasons for the increased use of high-density resins. The greater rigidity of these materials is undoubtedly most important, allowing the use of thinner bottle walls and providing lighter-weight and lower-cost packages. This economic advantage is especially apparent in bottles with capacity of 8 oz. or more. Other advantages of the high-density materials are lower permeability and higher use temperatures.

At present, the largest volume market for high-density bottles[5] is liquid

*Technical Service Engineers, Plax Corp., Hartford, Conn.

1 See "The Squeeze Bottle," MODERN PACKAGING, June, 1959, p. 102; "And Now Blow Molding," *Modern Plastics*, Nov., 1959, p. 83.
2 See "Blow Molding—Economics and Markets," *Modern Plastics*, July, 1959, p. 88; "Why the Fast-Growing Market for Big Polyethylene Containers," *Modern Plastics*, June, 1959, p. 85.
3 See "Shoe Shine Made Easy," MODERN PACKAGING, May, 1960, p. 102.
4 See "High-Density PE Containers," MODERN PACKAGING, Dec., 1960, p. 121, and Jan., 1961, p. 112; "How to Speed Up Plastic Bottle Testing," *Package Engineering*, April, 1961, p. 66.
5 See "Big Push on Plastics," MODERN PACKAGING, Oct., 1959, p. 109; "New Champ of Detergent Bottles; High-Density PE," *Modern Plastics*, Aug., 1959, p. 73.



LIGHT WEIGHT. High-density polyethylene bottles of baby blue, with metal lids of the same color, package prenatal tablets in 100s. (*Continental Can photo*)



UNBREAKABLE all-plastic disposable unit, in two sizes. A removable green plastic cover protects a pre-lubricated applicator tube. (*Owens-Illinois photo*)

Properties of plastic bottle materials

Material	Polyethylene			Cellulose acetate	Poly-propylene	Polystyrene	Vinyl	Nylon	Acetal
	Low density	High density							
RESIN DENSITY	0.92	0.95[3]	0.96[3]	1.2 to 1.3	0.90	1.0 to 1.1	1.2 to 1.4	1.1	1.4
PERMEABILITY TO									
WATER	Low	Very low	Very low	High	Very low	Moderate	Mod.—low	Moderate	Moderate
ALCOHOL	Low	Low	Low	High	Low	Moderate	Moderate	Mod.—high	Moderate
ACETONE	Moderate	Mod.—low	Mod.—low	Attacks	Mod.—low	Attacks	High	Low	Low
KEROSENE	High	High	High	Low	High	Swells	Low	Low	Low
CARBON TET.	Very high	High	High	Attacks	High	Attacks	High	Low	Low
RESISTANCE TO IMPACT	Excellent	Good	Good	Fair—Good	Poor—fair	Poor—good	Poor to excellent	Good	Good
CLARITY, NATURAL MATERIAL	Milky transparent	Milky translucent	Milky translucent	Clear	Milky transparent	Clear to opaque	Clear to opaque	Clear to milky	Very cloudy
STIFFNESS	Low	Moderate	Moderate	Mod.—high	Mod.—high	Mod.—high	Low—high	High	High
PRESENT USE[1]	Large	Large	Large	Small	Small	Small	Small	Small	Small
COST[2]	Low	Low	Low	Moderate	Low	Varies	Varies	Mod.—high	Mod.—high

[1]Number of containers used commercially. [2]Comparative cost per bottle. [3]The differences here may occur in composition as well as in density.

dishwashing detergents. This was the first area in which plastic competed directly with glass and metal on an economic basis. Well over 90% of the containers now used in this field are plastic. Bottles are blow molded in 12-, 22-, and 32-oz. sizes from both straight ethylene polymer and ethylene-butene copolymer resins of about 0.95 density. Typically, a 12-oz. high-density round bottle weighs about 24 grams, costs about 5 to 6 cents. With paper label and closure, cost is about 6 to 7 cents. The 32-oz. size with label and closure costs about 11 to 12 cents.

During the past year, sizable quantities of bottles also have begun to find use with heavy-duty detergents, fabric softeners, outboard motor oils and, most recently, with household bleaches.[6] Bottle sizes here range up to one gallon. Thus far, the penetration into these new markets has been limited, but conversion of high-speed filling and handling equipment is being made rapidly to accommodate the new plastic packages. Other applications of high-density polyethylene bottles in the household, cosmetic, drug, automotive, industrial and chemical fields are in Table I, p. 279.

One feature of plastic containers which has aided their penetration of the household-chemical market is the freedom of design in developing custom shapes for product identity. A few design hints follow:

1. High-density polyethylene bottles usually are designed at appreciably lower weights than comparable low-density bottles to take advantage of the greater stiffness of the material and thereby reduce cost. Minimum weights often are limited by the rigidity required for easy handling or for processing on automatic machinery, or by merchandising needs.

2. When packaging detergents and other products tending to cause environmental stress cracking (i.e., fracture of material from excessive stress when in contact with certain liquids), give special attention to three points: containers should be designed to avoid sharp corners and thin sections next to thick ones; high stress crack resistant material of 0.95 density, rather than 0.96, should be used; proper blowing conditions should be used.

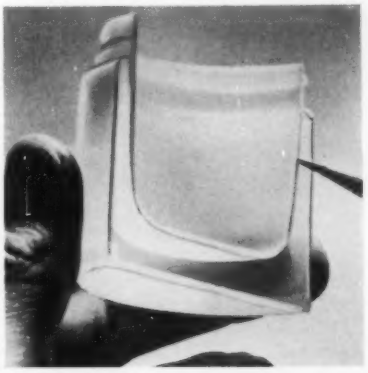
3. Products which cause sidewall distortion of thin-walled containers, for some reason such as absorption of oxygen from the headspace, frequently may be packaged satisfactorily in oval or oblong shapes, which tend to conceal deformation.

4. Bleach and other light-sensitive products require the use of special pigmentation systems formulated to reduce light transmission through the container and thereby minimize product decomposition. The same formulations also are advantageous for use with certain liquid detergents and pharmaceutical products.

5. High-density polyethylene bottles used as dispenser, spray or dropper packages should be somewhat oval in shape to facilitate squeezing—just as the familiar oval-shaped metal oil can promotes easier dispensing.

The use of nonreturnable ½- and 1-gal. high-density polyethylene bottles produced in stock molds has kept pace with the increase in custom packages. One-gallon modified square bottles, made on automatic blowing equipment, typically weigh about 90

[6] See "Bleaches Move To Plastics," MODERN PACKAGING, Jan., 1961, p. 96.



DOUBLE-WALLED plastic jar seals in a protective shield of air between walls and reduces danger of breakage. Designed for products with consistency of cosmetic creams. (*Jar, Imco Container Corp.*)



STAND-ON-CAP tube of polyethylene is especially lined to prevent loss of essential oils. An external barrier coating adds protection against oxygen transmission. (*Photo, Bradley-Sun Div., American Can Co.*)



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MATERIALS FOR Celanese MODERN PACKAGING

POLYETHYLENE FILM . . . ACETATE FILM AND SHEETING . . . PLASTIC CONTAINERS

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Canadian Affiliate: Polybottle Limited, Toronto and Canadian Chemical Company Limited, Montreal, Toronto, Vancouver • Export Sales: Amcel Co., Inc., and Pan Amcel Co., Inc., 522 Fifth Avenue, New York 36

Table I—Applications for high-density polyethylene bottles

Capacity designations: 1 = under 12 oz.; 2 = 12 to 32 oz.; 3 = 33 oz. to 1 gal.

Household		*Cosmetic*		*Drug*		*Automotive*	
Dish detergent	2	Suntan lotion	1	Rubbing alcohol	2	Car wash, polish	2
Laundry detergent	2-3	Cleansing lotion	1	Capsules	1	Hydraulic oil	2
Bleach	2	Child's shampoo	1-2	Massage lotion (hospital)	1	Windshield cleaner	1
Rug shampoo	1-2-3	Shaving lotion	1	Merthiolate	1	Upholstery cleaner	2
Wax remover	2	Skin lotion	1	Eye drops	1	Whitewall cleaner	2
Bowl cleaner	2	Shampoo	1-2-3	Otic solution	1	Engine cleaner	2
Steam iron cleaner	1-2	Bubble bath	1-2	Vitamins	1	Winter windshield cleaner	3
Furniture cleaner	3	Foaming bath oil	2	Enema solution	3		
Oven cleaner	2	Hair rinse	2	Antiseptic Soap	2		
Cold water soap	1-2			Foot lotion	1		
Rust remover	1			Antibiotic	3		
Fabric softener	2-3						
Starch	2-3						
Floor wax	2-3						

Industrial and chemical

Insecticide	1	Leather dressing	3	Lube oil	1	Metal brightener	2-3
Glass cleaner	3	Embalming fluid	2	Ca hypochlorite	1-2-3	Sod, hypochlorite, 14%	3
Rug shampoo	3	Adhesive and glue	1-2-3	Antiseptic solution	3	Water system additive	2
Nurser bottle	1	Pre-spot liquid	3	Arsenic acid, 70%	3	Hydrofluoric acid, 52%	2-3
Liquid latex	3	Detergent (h.d.)	3	Liquid fertilizer	3	Milk machine cleaner	3
Disinfectant	2-3	Bakery additive	3	Vaporizer reservoir	3	Cleaner (all purpose)	2
Org. peroxide	3	Thermo-jug liner	3	Bilge cleaner	2	Stain remover (fabric)	1
Muriatic acid (pool)	3	Algaecide (pool)	2-3	Inks	1	Flavor extract	2-3
Outboard motor oil	2	X-ray, photographic chemicals	2-3				
		Dish detergent	3				

grams. Several designs are available with molded-in handles at slightly heavier weights. The popularity of these containers, particularly for industrial chemicals, is based on their durability, light weight and low cost.

Lined polyethylene bottles. Internal linings were developed to extend the usefulness of low-density polyethylene bottles. These linings, which are polymeric materials having permeation properties dissimilar to polyethylene itself, are applied to the inner surface of the bottles primarily for the purpose of reducing the permeation of one or more product components. Although suitable linings have not yet been developed for all needs, rates of permeation in some instances can be reduced by as much as 99%.

Linings frequently aid in the retention of product odor or flavor, eliminate greasiness and sidewall distortion associated with oil-based products, reduce solvent permeation, and help retain medicinal or other active ingredients.

Table II lists a number of applications of lined polyethylene bottles, with the reasons for use of the lining.

Other materials. Among the new materials being considered for plastic bottles is polypropylene. It has a very low density (0.90), greater rigidity than high-density polyethylene, good high temperature properties, and permeation characteristics similar to the high-density polyethylenes. Impact properties, especially at low temperatures, have held up broad usage for bottles but recent work with new copolymers eventually may solve this problem.

The vinyl materials, rather widely used for bottles in Europe, have seen only limited use in this country.

Acetal resins are of interest as bottle materials because of their outstanding mechanical properties and low permeability to nonpolar liquids including aerosol propellants. They are now used for the manufacture of all-plastic aerosol containers.[7]

In the past year, bottles manufactured of plastic alloys also have been introduced in limited numbers. These alloys commonly employ a polyethylene base blended with other thermoplastics.

The table on p. 277 lists properties of several thermoplastic materials used to blow mold bottles.

Excellent progress has been made in developing new packaging-line equipment, and in adapting existing equipment, for use with plastic bottles. This applies to nearly all areas, including unscramblers, filling machines, cappers, wraparound and spot labelers and packers. Equipment is generally commercially available to handle plastic bottles at whatever speeds are desired.[8]

Some bottle lines are run at rates well over 200 pieces per minute for household products, and at 120 to 150 pieces per minute in the pharmaceutical and cosmetic industries.

Decorating

Paper labeling is now being used on very large numbers of bottles,

7 See "First Acetal Aerosol," MODERN PACKAGING, Dec., 1960, p. 87.
8 See "Synchronous Line for Plastic Bottles," MODERN PACKAGING, Feb., 1961, p. 110; "Keeping Plastic Bottles Under Control," *Package Engineering*, Feb., 1961, p. 31; "Plastic Bottle Packaging," *Soap and Chemical Specialties*, Nov., 1960.

Table II—Products in lined polyethylene bottles

Reasons	*Product*
Prevent loss of volatile flavorants	Dentrifice; mouth spray; cough concentrate; nasal decongestant
Lower solvent permeation	Veterinary products; paint colorant; ink; leather conditioner; auto polish
Lower odor or perfume loss	Suntan oil; shampoo; spray deodorant; skin lotion; shave, pre-shave lotion; hair lotion; bath oil; nasal spray; topical lotion; baby oil
Retain oils; prevent bottle greasiness, sidewall distortion	Suntan oil; skin cleanser; pre-shave lotion; hair oil; topical lotion; veterinary products; baby oil; gauge fluid; oil for musical instruments, fishing reels
Retain medicinal or other ingredients	Hair dye; sunburn lotion; nasal spray; topical lotion; mouth spray; cough concentrate; gauge fluid; antiseptic spray

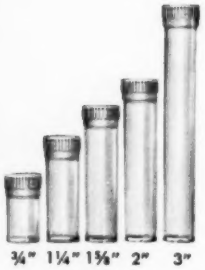
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3/8" (10½ MM)



¾" 1¼" 1⅝" 2" 3"

1/2" (15 MM)



1⅜" 1¼" 2" 3" 3⅝"

5/8" (18 MM)



2"

3/4" (22 MM)



2" 3⅝"

7/8" (26 MM)



2½" 3" 3½"

1" (30 MM)



2" 3" 3½" 4"

1 1/4" (38 MM)



1¼" 2" 3" 4"

1 1/2" (43 MM)



2¾"

1 3/4" (48 MM)



3"

2" (63 MM)

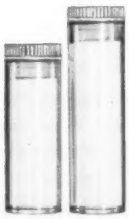


4" 6"

11/16"

SHELL VIALS

These vials are supplied with plug closures as illustrated.



2" 2½"

APOTHECARY VIALS



½ oz. 1 oz. 1½ oz.

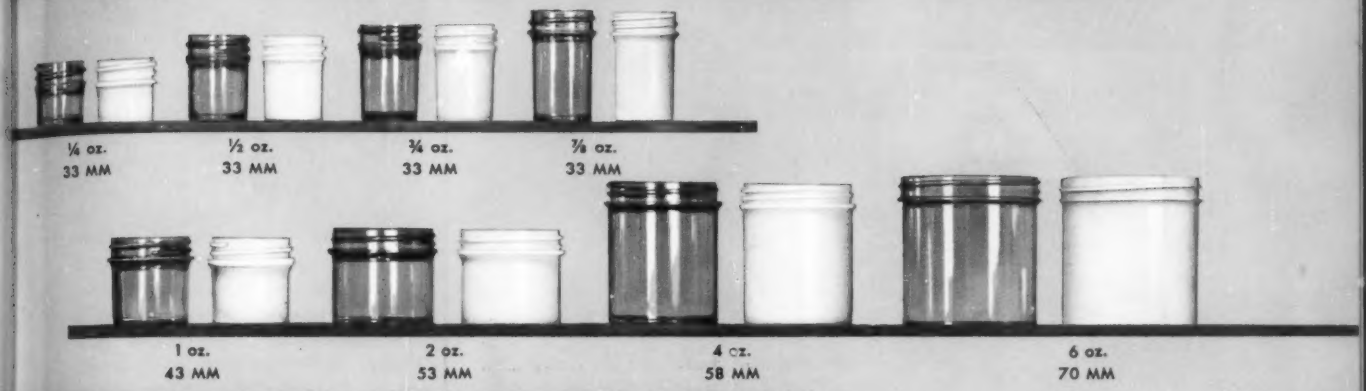
*Available threaded style only. All other vials in shoulder (as pictured) and threaded styles.

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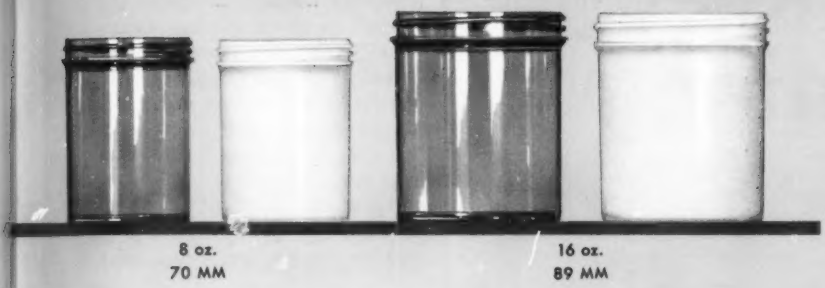
A Subsidiary of Brockway Glass Co., Inc.

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Clearsite®



SQUAT JARS



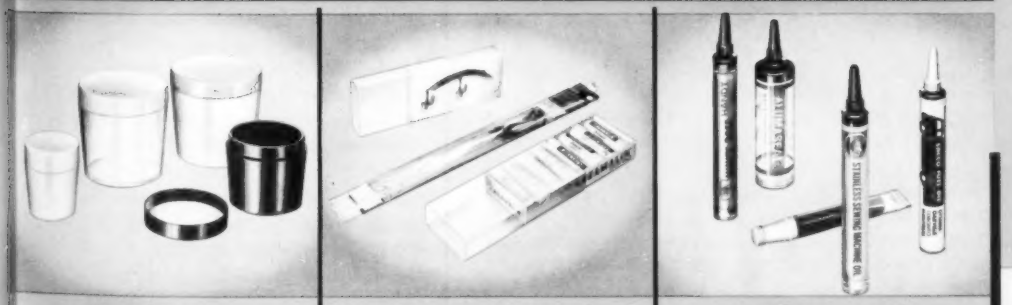
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Frank Lambert, Director of Research for Champlain-Zapata, is a native of England and a recognized plastics machinery designer. He was one of three plastics experts accredited to Britain's Central Scientific Technical Register, and has lectured on plastics in France and Germany, at Toronto University, and before the American Management Association. He is the author of numerous technical articles and a textbook, "The Molding of Plastics."

A Package-Forming Achievement

The practice of using expandable polystyrene for packaging and packaging components is hardly new. Many firms have turned to such packages to protect parts against breakage, to decrease shipping weight, to release packaging line workers for other duties, and to provide clean, waterproof packages. What is new—and excitingly so—is the development of a molding process that finally permits full realization of all of the economies of in-plant package forming with this material.

Conventional equipment has had many drawbacks: (1) The expandable polystyrene beads used by these units undergo two steps of processing—pre-expansion outside the molding section, then final welding in the molds. Requiring valuable plant space, the pre-expanded beads have to be stored to age in large capacity bins for anywhere from hours to days before injection in the molding section. (2) Fully automatic operation combining pre-expansion with molding in a continuous process never before has been achieved for economical package forming. (3) Previous units did not lend themselves to production-line integration.

CHAMPLAIN-ZAPATA has solved these problems and *more* with a new process. It handles expandable polystyrene in one continuous operation from raw bead to finished package or component. This is accomplished because the pre-expanded beads are fed *immediately* into the molding section in the required quantity. Thus valuable space is no longer needed for storage or aging. The machine's cycling time is the fastest yet achieved—easily fast enough to permit successful integration into high speed packaging lines. Its multiple-mold capacity, improved filling system and conveyorized handling of parts further enhance flexibility and ease of production line integration. This unit is fully automatic and requires no operator once it has been started. Result: Expandable polystyrene beads enter one end; finished packages or components exit the other, each package flowing directly and automatically into the packaging line to meet its product.

The packaging industry has seen the *upward* trend of *corrugated* packaging costs, as contrasted with the continuing *downward* trend of *plastic* packaging costs. With the CHAMPLAIN-ZAPATA process even greater economies of expandable polystyrene in packaging are made possible. Write for full details on how this process can serve *you*.

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PLASTICS MACHINERY INC.
Caldwell, New Jersey

especially with high-density polyethylene containers for the household chemical field.

Also, most plastic-bottle producers offer extensive decorating services.

Screen-process printing is by far the most common method of decorating and the quality obtained with the process is excellent.

The hot-stamp method is used less often, mainly with low-density bottles, but certain special effects are obtained only with this method.

Offset printing continues to grow in importance. Particularly good quality with multiple colors is obtained. Thus far, the method is used only with round bottles.

The heat-transfer process permits multicolor labeling of special shapes as well as round bottles. (See also p. 625.) Quality levels have improved considerably since the introduction of this method and it is finding acceptance with many products that can benefit from the economy of long production runs.

Additional information about the decoration of plastic bottles is in a separate section (see page 285.)

Aerosols

Various plastic materials such as phenolics, melamine and nylon have been used in the past for aerosol containers. As indicated previously, acetal resin is now most often used. Although the use of plastic aerosols is now small, prospects for market growth are encouraging because of recent reductions in the price of the resins.

Jars

Plastic jars can be produced by injection molding or by blow-molding methods from various materials, including polystyrene, low-density polyethylene, and high-density polyethylene[9]. However, size impression has been a major drawback, and this type package has not received wide acceptance in spite of the obvious advantages of nonbreakability, color, design latitude, and light weight with resultant low shipping costs.

Tubes

The maturing process noted in the plastic-tube industry in recent years has continued. A wide variety of products produced by the major brand companies is marketed in squeeze-to-use tubes. Many companies are using

9 See "Low-Cost Polystyrene Jar," MODERN PACKAGING, Sept., 1960, p. 122.



POLYPROPYLENE used for squeeze tube packaging scented, creamy product with oil base to take advantage of its grease resistance, retention of scents, chemical inertness, light weight, ease of printing. (*Tube, Thatcher Glass Mfg. Co.*)

new display techniques that are favorably accepted by the supermarkets and variety stores, including modified blister packages, novel designs of stand-up caps and unique hang-up features.

The technological development in the processing of these tubes as well as the use of new resins has progressed rapidly and has resulted in greatly improved quality for high-speed filling and sealing equipment. (See page 444.)

Plastic tubes are manufactured by a technique combining extrusion and injection molding and also by a blow-molding method. The extruded sidewall is uniform in thickness which facilitates printing by offset methods and heat sealing.

Although low-density polyethylene has been the dominant material in the past, tubes made of vinyl and high-density polyethylene are now being produced commercially. Specific vinyl formulations, both glass-clear and colored, have been developed for packaging greases and oils.

A recent development in the plastic tube field is the emergence of a polypropylene squeeze-to-use tube for a wide variety of uses in the food, chemical, cosmetic and pharmaceutical fields.[10]

These tubes bring to the packaging field a container noted for a high surface gloss, good transparency, high-temperature resistance, and excellent stress-crack resistance. In general, these tubes are made from a special grade of high-molecular-weight polypropylene and are being widely tested for many new uses.

Tube capacities from ⅛ oz. to 12 oz. are most commonly used. Diam-

10 See "The First Polypropylene Tube," MODERN PACKAGING, April, 1961, p. 198.

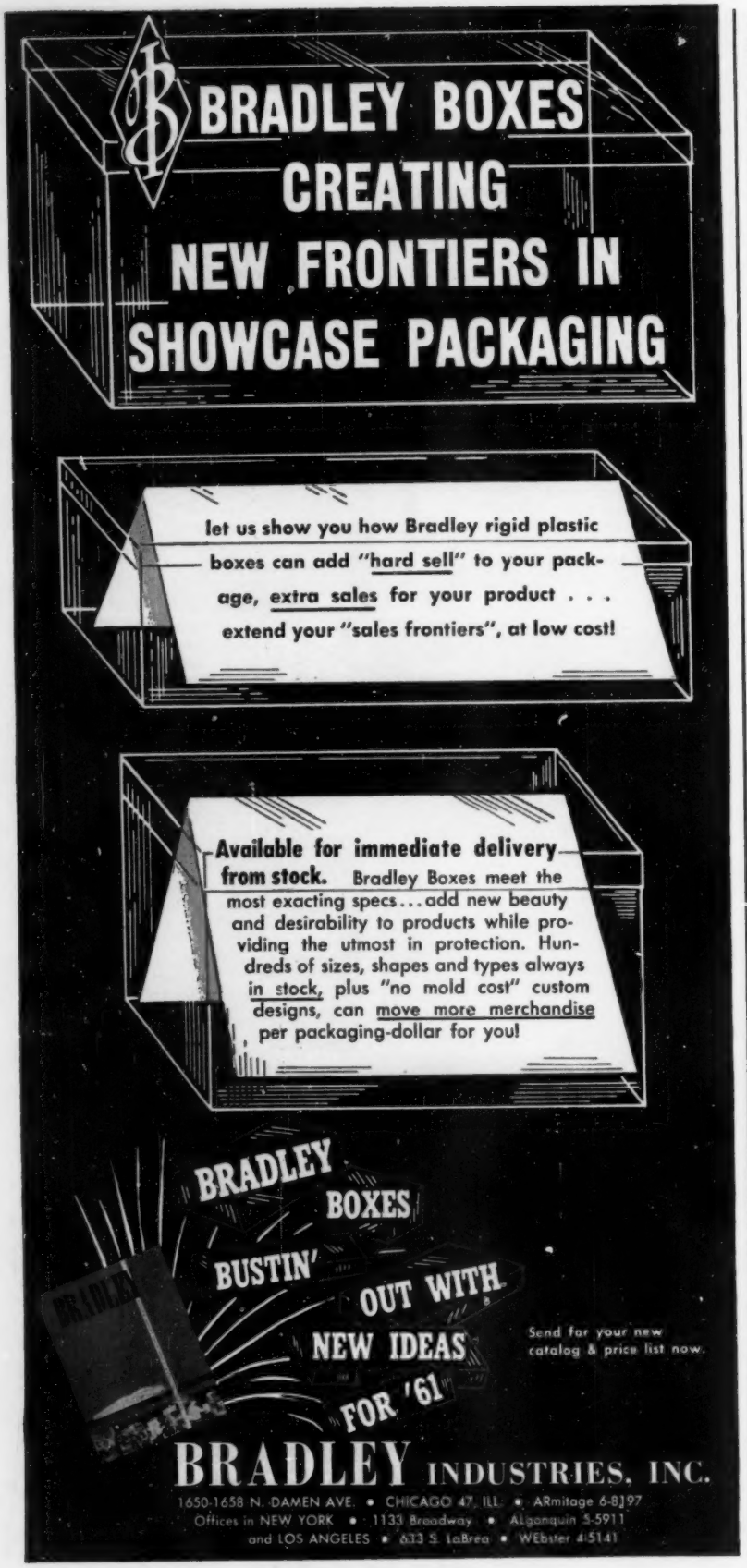
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eters generally vary from 7/16 in. to 2 in., with sidewall lengths typically varying from 2⅝ in. to about 8 inches. Wall thicknesses commonly used vary from 0.015 in. for smaller diameters to 0.020 in. for larger diameters. Tube diameters are now expressed in inches although millimeters have been used.

One of the most popular tube sizes is the 3-oz. capacity tube. Prices range from 4½ to 6 cents. The average is said to be about 5 cents. Polyethylene, vinyl and polypropylene appear to be all about the same price. Internal coatings add about 1½ cents to the cost of a tube.

Internal linings or outside coatings of various polymeric materials often are used to extend packaging characteristics of polyethylene tubes.

Tube linings serve the same purposes as mentioned for bottle linings —that is, to reduce product and oxygen permeation and to eliminate surface greasiness caused by oil-base products. Outside coatings on plastic tubes are used to:

1. Lower oxygen permeation into the package.
2. Impart product resistance to inks
3. Provide greater lustre.

Plastic tubes are printed by the offset method. Up to four colors are available. Quality of printing available on plastic tubes is excellent.

Many different products are now merchandised in plastic tubes with applications distributed among automotive, cosmetic, drug, food and household specialty products. Plastic tubes frequently are useful also as service containers for industrial products or as parts of various games or novelty sets. Typical examples of the types of products now sold in plastic tubes include: facial cream, suntan cream, shampoo concentrate, permanent-wave neutralizer, first-aid cream, cough syrup, sundae topping, dessert syrup, cake icing and decorative jelly, food color, oven cleaner, metal polish, sealing compound, glue, shaving cream, waterless hand cleaner, lighter fluid, paint pigment, outboard gear oil and grease.

Plastic tubes can be filled and sealed on standard equipment. Stock machines vary from manually operated units suitable for test and sample purposes to automatic machines which are capable of delivering 120 to 150 sealed tubes per minute. Also, modifications for standard metal-tube fill and crimp machines are available to permit handling of plastic tubes.

Decorating plastic containers

by Arthur N. Skeels*



THREE METHODS shown here for decorating and marking plastic containers. Top row: lithographing used because of extensive area to be printed front and back; dainty colors reproduced. Second row: hot stamping selected for permanence of marking, lustrous effect of gold and silvers and strong, opaque markings. Bottom row: screen process chosen as practical for large copy area, affording color versatility, and frequently most economical for combination of factors to be met. (*Art Decorating Co. photo*)

The decorating of plastic containers is a rapidly changing activity. New demands are being made constantly because there is a growing use of plastics in packaging and because merchandising requirements call for more attractive appearance. This, in turn, demands more advances in the decorating of plastics.

Rigid and semirigid plastic containers can be labeled by various means: hot roll-leaf stamping, screen process, offset printing, heat transfers, filling in, paper labels, decalcomania, engraving, rubber stamping and spraying.[1]

Of the aforementioned processes, hot roll-leaf stamping, screen and offset printing are the most commonly used techniques of integral labeling. Along with these, packagers can now consider the newer method called heat-transfer decorating ("Therimage").

In the examination of a decorated package, hot roll-leaf stamping appears and feels depressed; screening feels raised on the plastic surface because of the heavy laydown of ink; offset is flush with the printing surface, and is distinguished by its greater depth of impression. Heat transfer is similar to offset in appearance. However, its distinguishing feature is a clear, high-gloss outline outside the indicia.

Hot-stamping and screen-process costs are about equal, although one or the other may have the advantage in individual cases. Determining factors are the area of the design (which defines the quantity of roll leaf consumed) and the number of passes through the press each container requires. Each complete design or each color of a design generally requires a separate pass. The same is true of the screen printing with the exception of front and rear labeling of round packages, where the container is rotated against the screen and both labels applied in a continuous operation. Round containers may be printed in like manner by offset. However, the offset process is slightly more expensive until you get into multicolor imprinting.

Cost of offset and screen-process printing is largely dependent on the design. For front and back labeling by these processes, another factor influencing cost is the container shape, inasmuch as elliptical or rectangular packages require separate passes.

Heat transfer is advantageous because of its potential economy for multicolor decoration.

Hot stamping is a versatile and relatively inexpensive decorating method, embodying quality, wear resistance, productivity and ease of handling. A pigment-colored leaf or foil (cellophane or acetate-film backing) made in any and all colors is deposited under heat, pressure and carefully controlled time to release the pigment onto the plastic container. The pigment actually becomes homogeneous with the basic plastic material.

Unfortunately, leaf which functions on one type of plastic will not work on all types. It is, therefore, essential that the leaf be carefully chosen. Heat, pressure and dwell time are also carefully controlled to achieve the best bonding and highest productivity at lowest cost. Stamping equipment has performed at rates as high as 4,500 and as low as 60 pieces per hour. Since initial investment for properly machined dies is relatively high, this process is not often used for short runs.

In hot-stamping operations, all containers must be rigidly supported. Hinged plastic boxes may be marked after assembly if the hinge opens at least 90 deg., but the "hit" always must be made on a solidly backed up surface or the container may shatter. Flexible polyethylene bottles lend themselves very well to this marking operation, inasmuch as properly machined holding fixtures or "nests" control the collapse of the container. However, once a container has been hot stamped, it cannot be reclaimed. A challenging innovation where hot stamping is concerned is the new

*President, Art Decorating Co., North Bergen, N. J.

1See "Decorating Molded Plastics," MODERN PLASTICS, April, 1959, p. 91.

Comparison of processes for printing polyethylene bottles[1]

Characteristics	*Screen process*	*Hot stamping*	*Offset*
Permanence	Good	Good	Good
Colors	All	All	All
Metallic effects	Fair	Good	Fair
Multicolor			
Appearance	Good	Good	Fair
Practicality	Poor	Fair	Good
Require separate pass for each color?	Yes[2]	Yes[3]	No
Registration	Fair	Fair	Good
Production speeds	Good	Good	Good
Size limitations	None	None	None
Holding-jig requirements	Simple to difficult	Simple to difficult	Simple to difficult
Laydown of ink	Light to heavy	Light	Light
Appearance			
Small type	Good	Fair	Good
Heavy designs	Good	Good	Good

1This chart is intended only to supply a rough definition of some commercial methods of integrally marking polyethylene bottles. Certain conditions will alter this rough evaluation. In any case, your decorator is the best guide.
2By change of designs, where colors are not integrated, split screens can be employed and up to three colors can be printed in a single pass.
3Mechanical set-ups involving multiple stamping heads in series have converted hot-stamping multicolor work into practically an automatic operation, especially on long runs.

bright gold and silver effects available. The base material is polyester film aluminized by the vacuum deposit method. This bright silver color can be overcoated with a color finish to achieve a gold effect. The resulting tarnish-resistant material is more brilliant than real gold, but far more economical. Excellent new applications are found in the decorating of cosmetic boxes. Large-volume use is anticipated for holiday liquor packages and other gift packages.

Screen process is a tried and proved process in the plastic decorating field and can be used to attain quality, wear resistance and fairly good productivity at a reasonable cost on all types of plastic containers. The ability of screened paints or inks to adhere is chemical in nature. Recently developed thermoactive inks and paints which polymerize to an insoluble film —having maximum wear resistance, flexibility, gloss and chemical resistance—have brought this process to its present high standard of acceptability.

Two methods are used in transfering the screened design to a plastic container—both involve use of a rubber squeegee. One is a slower, hand-operated squeegee; the other is machine operated. With the former, productivity ranges from 250 to 500 pieces per hour; with the latter, 500 to 2,500 pieces per hour.

In the use of this process, the problems are the choice of the proper inks or paints, correct mesh of the screen and choice of photographic film transfer medium (in preparation of the screen) together with the proper consistency of the rubber squeegee. Holding fixtures play a vital part in this process and must be properly designed to avoid blurring during transfer of the design. The process gives a heavy laydown of paint with sharpness of detail. It is not recommended for small, solid-text portions (such as instruction copy on the back panel of a container) for the viscous paint is inclined to fill in small letters.



DECORATION ON POLYETHYLENE bottle done by heat-transfer process which achieves crispness in lettering, detail in illustrations. *(Dennison "Therimage")*

Another limitation is that only flat areas can be marked; thus the imprint must be designed to fall well within any raised ribs, etc. Compared with the hot-stamping dies, the screens are relatively inexpensive to prepare. Screened items, however, require approximately 15 min. in a drying oven which accounts for the lower production rates. Qualitywise, however, the results are comparable.

Offset printing. Decorating by offset is performed with smoothness, fine detail and delicacy of design unobtainable in any other process. Abrasion resistance is good, in most instances, through the inclusion of proper solvents in the ink which attack the plastic base. The outstanding virtue of this process is the ability to print multiple colors in a single pass.

Color registration is among the most accurate in the plastics marking field and offset provides the most satisfactory method, thus far, of printing halftones on plastic containers. This process has also given good results in topping or "kissing" the surfaces of molded-in lettering. Opaque backgrounds seem to display offset best.

Recently, users of plastic containers have favored design over transparency. As a result, offset colors are intensified by being printed on the solid-color backgrounds. Richer, more effective decoration with greater aesthetic value is achieved. These effects are further improved with overprinting of clear, transparent finishes that increase luster, intensify printing and provide a protective coating.

Examples of these advances in offset printing are found especially in the plastic tube field, where offset printing has achieved great excellence.

Heat-transfer decoration. This method preprints a design on paper backing. The design plus a semitransparent release coating is transferred by means of heat and pressure to a plastic container, film, foil or paper. The transfers are supplied in roll form and can be applied automatically at speeds of 100 or more containers a minute. The paper backing serves only as a carrier. (See heat-transfer article and printing chart in Section 15.) The method has had excellent use in labeling polyethylene bottles for adhesives, insect repellent and similar items. Heat transfers are now being used for plastic bottles for detergents and cosmetics.

FOAMED PLASTICS FOR PACKAGING

by G. C. Kiessling*



VARIED USES of expandable polystyrene are shown; two-piece pack for vermouth; flocked display tray for cosmetic samples; flocked tray for Sears flatware; molded jars in a range of sizes; platform for a Gillette set; three examples of vacuum-formed extruded sheet. (*Koppers photo*)

Plastic foams continue to hold the spotlight as one of the fastest-growing plastic entries in the packaging field, for they are extremely versatile materials which provide outstanding combinations of physical properties. Their low density and inherent cushioning characteristics offer product protection at a relatively low cost. Also, foams offer advantages of extremely wide choice in types and forms.

New developments

Along with the rapid introduction of new foam-plastic packaging applications, the technology of the plastic foam field continues to move ahead at a rapid pace. Recent advances are:

- Extruded foamed polystyrene sheet. This soft, resilient material is available in widths up to 48 inches, thicknesses of 5 to 125 mils, and densities of 4 lbs./cu. ft. and up. The sheet in several colors can be used as is or as a laminate with paper, board or other sheet plastics. It can be thermoformed into trays, platforms or containers. Foamed sheet can be embossed with pleasing patterns for use as attractive wrappers and cushioning pads. The extremely wide choice of surfaces, shapes and other desirable packaging properties, including economy, make foamed sheet one of the most interesting and challenging new materials available to packagers.
- Expandable polystyrene pellets are now available for the extrusion of sheet, rod stock and other shapes of foam polystyrene. This material also can be blow molded into hollow containers or shapes.
- A new frothing or pre-expansion technique for producing rigid or flexible polyurethane foams has been developed. This method provides better control of the foaming process and makes possible lower tooling costs.
- New automatic equipment for molding expandable polystyrene is now offered—to perform at short molding cycles for higher production rates and consequent lower costs.
- Polystyrene foam in the form of extruded "spaghetti" is used as loose fill in packaging with many cost-saving and convenience advantages. Strands 0.025, 0.045 and 0.093 in. in diameter are available. Densities range from 0.35 to 0.5 lbs./cu. ft.

Types available

Expandable polystyrene. This type of plastic foam usually is obtained through a molding process. Small, sugar-like, high-density granules or beads that contain a nontoxic blowing agent are given a "pre-expansion." This pre-expansion is a controlled process to produce beads at uniform densities ranging from one to 20 lbs./cu. ft. The expanded beads are formed into the desired piece shape by further steam heating in a jacketed aluminum mold. The molded piece is then cooled by water introduced into the jacket, and the piece ejected. Trays, jars, molded-to-shape packages and shipping containers are produced in wide variety by this method.

Expanded polystyrene. This is a foamed plastic commercially available in the form of planks or boards. It is similar to expandable polystyrene in many respects. However, since the expanded polystyrene is available only in the solid form, it must be machined to the specific shape required. The machining is done with conventional woodworking tools such as shapers, planers, routers, sanders and saws. Electrically heated wires can be used instead of saws, and will make neat, sharply defined cuts. Platforms and compartmented trays or bases are produced from plank stock in wide variety, especially for pharmaceuticals, electronic parts and the like. The special advantages are ease of forming, cushioning properties, attractiveness and low cost.

Polyurethane foams. The reaction

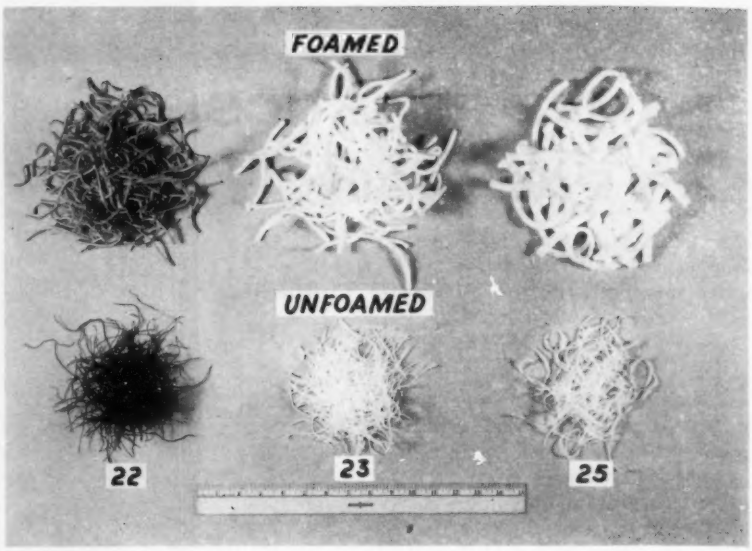
* Technical Director, Expandable Polystyrene Product Development Department, Plastics Division, Koppers Co., Inc., Monaca, Pa.

of a polyester, diisocyanate and water forms urethane plastic foam. By varying the formulation, this foam can be made soft and resilient or hard and rigid. The reaction generates little pressure, and the foam piece can be formed in an inexpensive mold or foamed in place within containers made of light-gauge metal, wood or corrugated paper. Because its density and resiliency are controllable, a packaging material for the safe shipment of many items can be produced with this material.

Molds for polyurethane and expandable polystyrene foams are generally made of aluminum and are inexpensive in comparison to molds for the injection molding of solid plastic pieces. Molding cycles for polyurethane foams are similar in duration to those for the expandable polystyrene foams. Since there is natural adhesion of the urethane foam to the mold, a release agent, usually a wax, must be carefully applied so that the foam piece can be easily removed without damage.

Cellular polyethylene. This plastic, which has recently become commercially available, is a new form of the familiar "squeeze" bottle plastic—polyethylene. Cellular polyethylene is produced by an extrusion process and is available in plank or board form, which can be machined to the desired shape with the same type of tools used in fabricating polystyrene boards.

Cellular polyethylene has excellent chemical resistance, low water absorption, good thermal insulation value. Its compression deflection characteristics provide good impact absorption with almost complete dimensional recovery. Calculations based on some of the commonly used formulas in the packaging field indicate that, compared to other packaging materials, cellular polyethylene can provide proper protection at less thickness.



NEW SPAGHETTI-TYPE foamed polystyrene is designed for superior cushioning function. Strands interlock and prevent settling; are noncorrosive, nondusting. Shown are three sizes before and after foaming. Expansion is about 20 times original size. Low density makes for economy. *(Dow Chemical photo)*

New types

Some new types of plastic foams have been developed. These materials in most cases are still experimental and untried in commercial packaging.

Epoxy foams, now available in the 2.0 to 2.5 lbs./cu. ft. density range, can be foamed in place. Their chief advantages are exceptionally low temperature insulation, excellent adhesion, extremely low moisture absorption.

Cellular polypropylene offers good electrical and chemical resistance along with resilience.

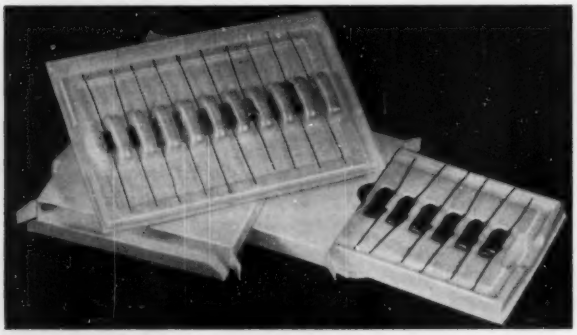
Silicone foams are rigid, light materials for specialized service at temperatures up to 700 deg. F. Their cost is high, but new improvements have reduced available densities to 3.5 lbs./cu. ft. Expanded silicone rubber provides cushioning characteristics and heat resistance.

Other cellular plastic materials available are: phenolic foam, cellular cellulose acetate, vinyl foam, and cellular urea formaldehyde. As yet, these materials have not been evaluated or demanded for commercial packaging applications.

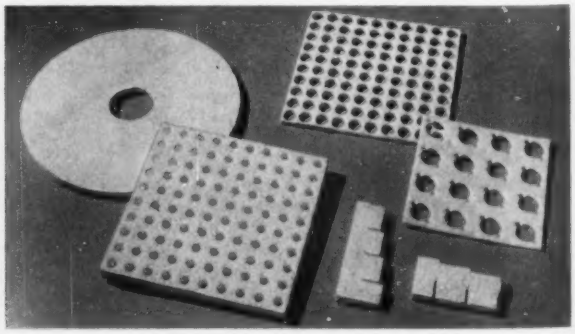
Properties

Thermal insulation. Due to their unicellular structure, the foam plastics provide excellent thermal insulation properties (see thermal conductivity in the properties table p. 289).

THERMOFORMED FOAMED SHEET provides light weight, tailored-to-fit contours. Cavities are designed front and reverse to handle range of sizes for electronic parts. *(Applied Research & Development photo)*



DIE-CUT shapes are widely varied for use in internal cushion packaging. This foamed polystyrene sheet has high energy absorption value and, in addition, eliminates need for molding. *(Resilo-Pak cushioning, Armstrong Cork Co.)*



Properties of foamed plastics

Property	*Expanded polystyrene (molded shapes)*	*Expandable polystyrene (boards, planks)*	*Polyurethane rigid (molded shapes)*	*Polyethylene (boards, round, oval, planks)*
Density, lbs./cu.ft.	2.0	1.8	1.5-3.0	2.0-2.2
Thermal conductivity (btu/sq. ft./lb./°F./in.)	0.24 (70° F. mean)	0.28 (40° F. mean)	0.1-0.2 (70° F. mean)	0.35 (70° F. mean)
Tensile strength, p.s.i.	55	55	30-80	25
Compressive strength, p.s.i.	20	16	30-60	10*
Moisture absorption, percentage by weight	Nil	Nil	1.8	Nil
Water vapor transmission, perms	2.0	1.5-2.0	3-4	0.2-0.4**
Maximum service temperature °F.	175-185	155-175	200-250	160

*25% deflection.
**Grains of water/hr./sq.ft./in. thickness/in. mercury pressure differential.

Since foamed plastics resist moisture, always detrimental to thermal efficiency, the thermal insulation advantage is maintained under high humidity conditions. Blood plasma, bull semen, frozen foods, pharmaceuticals, cosmetics, candy and printing inks can be shipped in insulated containers made of foamed plastics without damage or loss of quality despite exposure to wide temperature extremes. Vials of perishable vaccines, when inserted in foam plastics and stored in the refrigerator at night, are easily kept on the physician's desk during the day, cool, safe and ready for use.

Chemical inertness. To prevent deterioration of sensitive articles packed in contact with the packaging material, it is important for most packaging applications that the dunnage or cushioning be essentially neutral in *p*H. Molded specimens of expandable polystyrene have a *p*H value of 6.6 according to MIL-P-6064A, paragraph 3.2.3.2 (b), performed as per Specification JAN-B-121.

Since molded foam plastics have essentially a neutral *p*H, plated electron tubes can be shipped, without risk of corrosion, in containers molded of these materials. Previous practice required expensive film barriers to protect such tubes from the sulfur content of paperboard cartons. Carboys containing highly corrosive acids are shipped in crates and boxes lined with foam polystyrene, due to the excellent shock and chemical resistance of this packaging material. In another successful commercial application, four 1-gal. bottles containing acid are shipped in a package composed only of two molded-to-fit foam polystyrene halves, bound by one glass-reinforced adhesive tab.

Low water absorbency. Due to their resistance to moisture, foamed plastics are used without additional moisture-barrier protection for export shipment of delicate instruments. Humidity control, so important in the shipment of optical and other delicate equipment, is also possible with foam packaging.

Shock absorbency. Foamed plastics have excellent energy-absorbing properties, variable according to type of foam and density. For example, one type of resilient polystyrene cushioning material has one of the highest per-dollar energy-absorption values of any of the cushioning materials.

Weight reduction. Since foam plastics are light in weight, substantial cost savings result from their use as entire packages or as packaging components in conjunction with conventional cartons or boxes.

Sensitive magnetrons are currently being shipped in foam plastics and, since most shipments are made by air, weight and volume reduction are of prime importance. Volume of the new package is 74% less than the old one.

Complete mailing tubes molded of expandable polystyrene are used for mailing pharmaceuticals and light machinery replacement parts at a minimum of postage.

Economy. Due to their low density, foamed plastics produce a high-volume yield—often permitting savings.

It will be noted in the price table (see below) that cost per cubic inch of molded polystyrene is about 2/100ths of a cent. This is much lower than that of any other type of molded plastics. Moreover, the extruded foamed sheet (10 mil gauge) is as low as 6 cents per 1,000 square inches. This compares most favorably with the cost of other plastic sheet materials. These comparisons, of course, apply solely to material costs. Other factors—such as molding, mold amortization and performance characteristics—must be considered before a realistic comparison can be made. Even so, the high yield per pound of foamed plastics is an important basic advantage.

Design considerations

The selection of the right type of foamed plastic for a particular packaging application depends on many considerations. Since molds are required for the expandable polystyrene and the polyurethane, sufficiently long runs must be involved to make mold amortization practical. Although such molds are inexpensive in comparison to injection molds, their cost cannot be ignored.

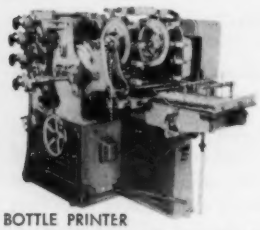
Foam pieces machined from boards or sheets require the least capital investment for forming. However, the scrap from the operations may be a total loss—or may be sold at much

Prices of foamed plastics compared

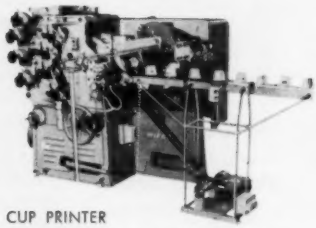
Foam	*Price*	*Density ranges (lb./cu. ft.)*	*Cost (cents) per cu. in.*
Expandable polystyrene	$0.37 lb.	1.0-2.0	0.02-0.40
Expanded polystyrene	0.10-0.20/bd. ft.	1.0-4.5	0.07-0.14
Polyurethane	0.45-0.60 lb.	1.5-40.0	0.04-1.40
Polyethylene	0.22/bd. ft.	2.0-2.2	0.15

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WIFAG **4-COLOR OFFSET PRINTING MACHINES . . .** for printing seamless metal cans, plastic bottles, jars, vials, cups, metal and plastic collapsible tubes, which reflect fine Swiss craftsmanship with precision and exactness.



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Production type, Automatic loading, Plastic Bottle Printing Machine with chain conveyor and feed table. Cap. 4" dia.



CUP PRINTER
Universal Printing Machine for Plastic and Paper Cups. Automatic loading and unloading. Cap. 4⅛" dia.



UNIVERSAL PRINTING MACHINE with mandrel type turret for plastic bottles and tubular containers; can have tapered sides. Cap. 4⅛" dia.

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A complete FULLY AUTOMATIC DECORATING LINE for tubes and aerosol cans.

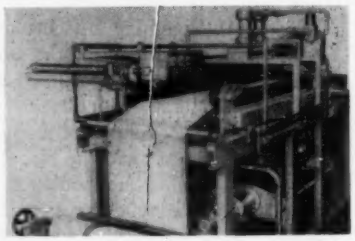
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5 models for packaging containers for holding liquid, viscous and semi-rigid articles having intricate container designs and for visible packing of solid goods such as skin, blister packing, etc.



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EXTRUDED polystyrene foam prevents marring of fragile items such as china. *(Sun Chemical Corp., Dyna-Foam Div., photo)*

less than the material originally cost.

Molded pieces require at least a two-degree draft for quick removal from the mold, and the thickness of the wall of the piece should not be below 0.150 inches. The densities of the foamed plastics are controllable in the molding process; or, the foam can be purchased in a series of densities ready for machining.

Expandable polystyrene foam can be molded at controlled densities from 1 lb./cu. ft. to as high as 20 lbs./cu. ft. The polyurethane foams range from 1.5 to 40 lbs./cu. ft. Expanded polystyrene board stock is commercially available at densities of from 1 to 4.5 lbs./cu. ft. (see table p. 289).

Since physical properties are generally proportional to density, the specific packaging job must be defined in detail before material is selected.

Most packaging applications use 2 to 3 lb./cu. ft. density material since this density range is optimum for a number of properties. Molding conditions in this range are not as critical as in other densities and generally result in economical production.

Design curves have been developed for the cushioning property of most foamed plastics. These curves serve as a basis for the selection of the material to be used for the specific packaging purpose. Unless a good history has been obtained for the foamed plastic selected, actual tests must be carried out to define the optimum size, shape and strength requirements for the package. There are several packaging designs characterized by the manner in which the article is located in the package. Each performs a specific protective function.

The *bracing technique* involves

(Continued on page 295)



Photo courtesy Kapgo Plastics Corp.

Goodrich-Gulf serves up a remarkable new plastic

New markets opened up for the Number 1 plastic, polyethylene, with the development of a high-density resin. It makes stronger, tougher, more durable products.

Now Goodrich-Gulf has perfected and introduced *Ameripol* high-density polyethylene . . . the only such material that combines durability with processability. Despite its high strength, it can be processed at no extra cost on conventional equipment. And its remarkable durability, and resistance to chemicals and heat, make it a preferred material for containers, for wire insulation, and plastic pipe.

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PHYSICAL PROPERTIES

AMERIPOL POLYETHYLENE

These AMERIPOL properties add up to Quality Polyethylene Products

PHYSICAL PROPERTY	UNITS	ASTM Method	Ameripol 32	Ameripol 34	Ameripol 35
Molecular Weight	—	—	50,000	80,000	100,000
Density	g/cc	D1505-60T	0.95	0.945	0.95
Melt Index (condition E)	g/10 min	D1238-57T	0.1–0.2	0.04–0.08	0.001
Flow Index (a) (condition F)	g/10 min	D1238-57T	24.0–28.0	8.5–9.3	4.0–5.6
Intrinsic Viscosity	—	D1601-59T	2.3–3.0	3.1–3.5	3.8–4.8
Vicat Softening Temperature	°C	D1525-58T	119	121	122
Tensile Strength At Break	psi	D638-60T	2250	2250	2700
Tensile at Yield, 20 ipm	psi	D638-60T	3450	3250	3450
Elongation, 20 ipm	%	D638-60T	120	320	560
Impact Strength (b) ⅛ x ½ bar	ft-lbs/in. notch	D256-56T	19	31	36
¼ x ½ bar	ft-lbs/in. notch	D256-56T	8	17	24
½ x ½ bar	ft-lbs/in. notch	D256-56T	0.9	1.9	4.3
Stiffness in Flexure	psi	D747-58T	115,000	115,000	120,000
Hardness	Shore D	D1706-59T	60	60	60
ENVIRONMENTAL PROPERTY					
Environmental Stress Cracking (c)					
With Antioxidant	hrs	—	65	445	>800
Without Antioxidant	hrs	D1693-60T	40	230	500
Thermal Embrittlement (d)					
With Antioxidant	hrs	(d)	185	>1000	>1000
Without Antioxidant	hrs	(d)	70	95	700

(a) Cutoff on flow index test made at the end of 30 seconds. (b) The impact strength test result is greatly influenced by sample size.
(c) ASTM Standard on Plastics, D1693-60T Method of Test for Environmental Stress Cracking of Type I Ethylene Plastics. This test, which has been adopted for Type I Ethylene Plastics is used herein for Type III in the absence of an official method.
(d) This test employs compression molded specimens, 5" x 0.25" x 0.05", three of which are wrapped and clamped around a ¼" mandrel. The apparatus is inserted in a nitrogen blanketed test tube which in turn is placed in an aluminum block @ 100°C. The value reported is the time until two of the three samples crack.

CHEMICAL RESISTANCE

AMERIPOL 34 POLYETHYLENE 30 DAYS @ 75°F

CHEMICAL	CHANGE IN VOL. % GAIN	CHANGE IN WT. % GAIN	ULTIMATE TENSILE	TENSILE @ YIELD	ELONGATION
Control			2250	3890	350
Acetic Acid, Glacial	0.73	0.97	2200	3440	400
Sulfuric Acid, 98%	0.32	0.13	2260	4060	360
Nitric Acid, 70%	0.66	0.63	2470	3750	260
Oleic Acid	0.66	0.62	2150	3600	320
Sodium Hydroxide, 50%	0.15	0.03	2180	3820	200
Ammonium Hydroxide, 28%	0.45	0.56	2060	3760	300
Ethanol	0.40	0.23	2270	3850	350
Ethyl Acetate	2.02	1.96	2260	3320	380
Acetone	1.21	1.02	2100	3490	300
Carbon Tetrachloride	8.12	17.10	2320	3000	800
Brake Fluid, SAE 10	0.24	0.29	2290	3670	320
Gasoline	6.92	7.20	2200	3110	520
Lube Oil, SAE 10	0.62	0.61	2360	3680	280
Distilled Water	0.06	0.06	2290	3740	360

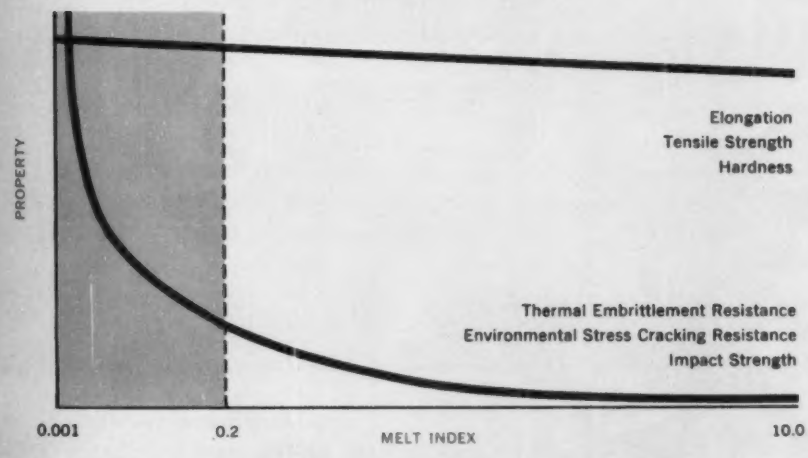
AMERIPOL®... so easy to process on standard equipment

SUPERIOR PROCESSABILITY

The unusual ease of processability of Ameripol polyethylene on conventional equipment—at no extra cost—represents a major benefit to plastic processors. This is evident in the graph below.

The upper, straight-line curve shows that certain physical properties, such as tensile strength, increase only slightly with decreased melt index. On the other hand, other critical properties, such as stress-crack resistance, impact strength, and resistance to thermal embrittlement are affected more drastically by small decreases in melt index. Ameripol, which lies within the shaded area of the graph, has processability virtually equal to conventional polyethylenes. But, Ameripol durability is vastly superior due to the sharp increase in "durability" properties below a melt index of 0.2. This is the limiting point of most other high-density polyethylenes. Other manufacturing methods either cannot produce a material below 0.2 melt index, or those materials that are produced cannot be processed reliably.

EFFECT OF MELT INDEX ON PHYSICAL PROPERTIES



MORE AMERIPOL BENEFITS

Clarity—Ameripol can be produced in a range of clarity from opaque through any degree of translucency to near-perfect transparency in films.

Gloss—articles molded of Ameripol develop a surface gloss approaching the "shine" and "feel" of glass.

Impermeability—Ameripol polyethylene offers a high resistance to passage of most gases and vapors.

Rigidity—parts made of Ameripol have a rigidity not obtainable with low- and medium-density polyethylenes, yet retain a degree of flexibility.

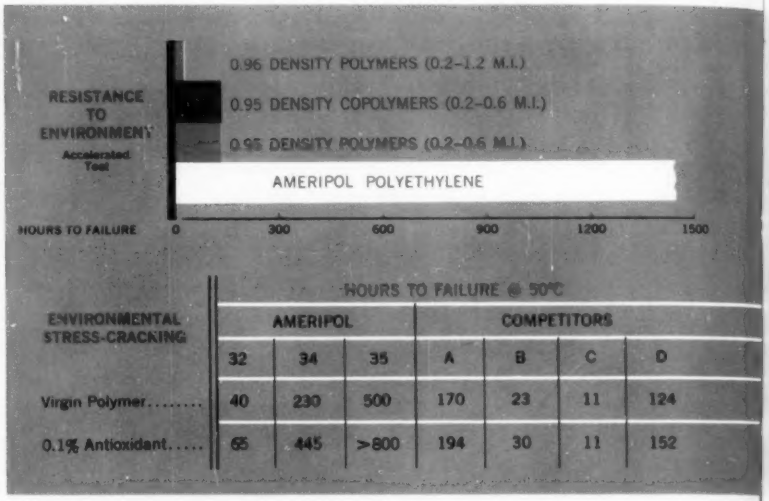
Goodrich-Gulf Chemicals, Inc.

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Ameripol . . . unmatched for durability

EXCEPTIONAL STRESS CRACKING RESISTANCE

This property is usually measured by ASTM test method D1693-60T. In this test, samples of polyethylene are immersed in Igepal CO630 and maintained at 50°C. The SCR is measured as the number of hours required for 50 per cent of the samples to fail by cracking. The accompanying graphs show the results obtained with Ameripol, compared to other high-density materials produced for similar applications: even without antioxidant, Ameripol 34 and 35 rate higher 'hours to failure' than any other competing material. With addition of antioxidant, SCR doubles—giving Ameripol an even greater margin of superiority.

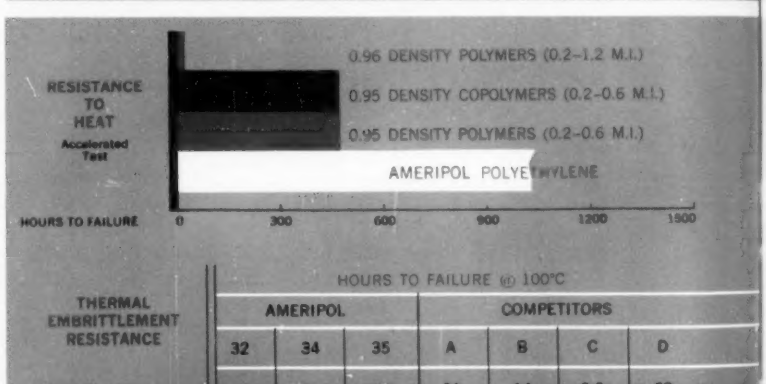


ENVIRONMENTAL STRESS-CRACKING	HOURS TO FAILURE @ 50°C						
	AMERIPOL			COMPETITORS			
	32	34	35	A	B	C	D
Virgin Polymer.....	40	230	500	170	23	11	124
0.1% Antioxidant.....	65	445	>800	194	30	11	152

EXCELLENT THERMAL EMBRITTLEMENT RESISTANCE

The Bell Laboratories test for thermal embrittlement is designed to measure the ability of a material to withstand elevated temperatures. Compression-molded samples, measuring 5″ x .25″ x .05″, are wrapped around a ¼-inch diameter mandrel and clamped in place. These samples, three to a mandrel, are inserted into a test tube under a blanket of nitrogen. Tubes are placed in an aluminum block and held at 50°C until two of the three samples crack. Goodrich-Gulf also employs this test at higher temperatures.

This test, when applied to other high-density polyethylenes, again illustrates the superiority of Ameripol polyethylene.



THERMAL EMBRITTLEMENT RESISTANCE	HOURS TO FAILURE @ 100°C						
	AMERIPOL			COMPETITORS			
	32	34	35	A	B	C	D
Virgin Polymer.....	70	95	700	81	14	5.5	63
0.1% Antioxidant.....	185	>1000	>1000	>1000	17	6.0	323

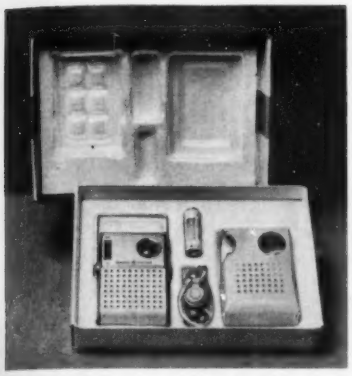
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Enlist the help of Goodrich-Gulf Technical Service. A sales engineer will help insure your product superiority by specifying the right grade of Ameripol. And, he will assist in production, application, shipping and storage of Ameripol high-density polyethylene.

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(*Continued from page 290*)



PLATFORMS of extruded polystyrene foam provide compact container for portable radio. *(Sun Chemical Corp., Dyna-Foam Div., photo)*

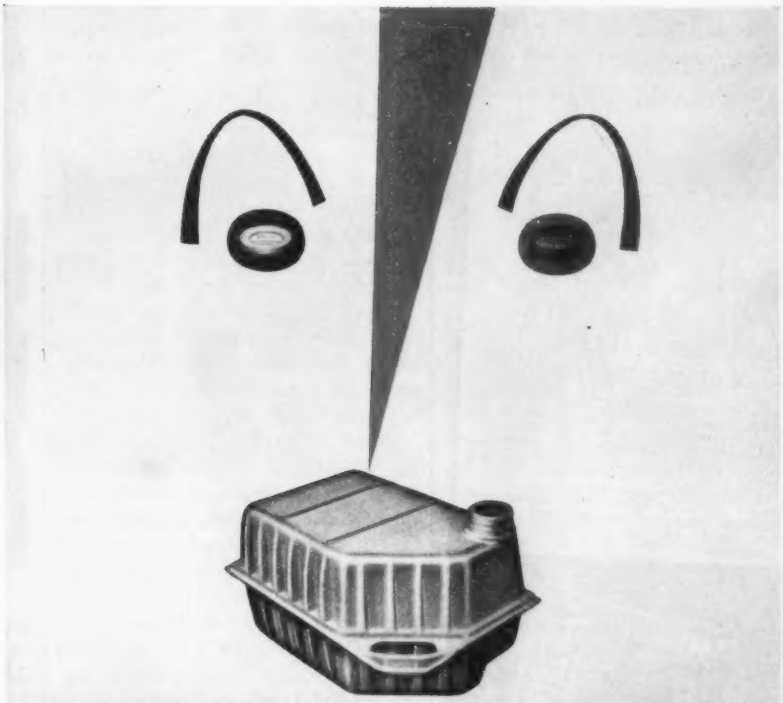
packaging to prevent movement of the contents in the container and also to distribute weight uniformly over the face of the container. *Blocking* implies holding irregularly shaped objects with relatively stiff materials to "block-out" voids. The resulting package becomes regular in shape and relatively easy to handle.

Materials often used for these purposes are wood, metal, and solid or corrugated fibreboard. The fact that expandable polystyrene can be molded to conform almost exactly to irregular contours, thus distributing shock loads uniformly over the surface of the packaged object, makes it useful in this type of application. Moreover, as concentrated loadings can be avoided, expandable polystyrene is less apt to mar or pressure-mark by offset the surface of the packaged article.

Test packages often are made from expanded polystyrene to establish functional design features. Depending on the number of parts, molds can be built to evaluate new packaging materials. The foamed plastics are considered to be useful in bracing and blocking packaging, flotation packaging and decorative packaging.

The *flotation* packaging method involves protection of the article from shock and vibration by enclosing it in a thick cushion of material, usually completely filling the outer container. Molded foams, particularly the expandable polystyrene and polyurethane, meet the requirements of this technique better than waste, shredded paper or fibreboard, and can eliminate the need for an outer container.

If design curves for cushioning be used, three factors must be known:



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yet FLEXIBLE
PLASTIC VIALS
or TUBES

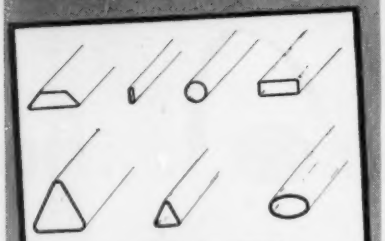
LUSTEROID . . . the modern plastic containers for pharmaceutical, industrial and consumer products. Attractively colored — production labeled, each vial or tube makes an eye-catching, crystal clear or opaque product display. Lightweight LUSTEROID containers are unbreakable, crush resistant and inexpensive to use and ship.

STEP UP SALES . . . PROTECT PRODUCTS . . . REDUCE COSTS Send for brochure, samples and prices.

Lusteroid **CONTAINER COMPANY, INC.**

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EXTRUSIONS FOR PACKAGING



RIGID, CLEAR-PLASTIC PACKAGING TUBING

Thin, strong container tubing for packaging applications is available in a wide variety of round, multisided or asymmetric configurations. Supplied to users' specifications in either 6' lengths, or pre-cut to exact length, tubing is available crystal-clear (for maximum product exposure), tinted, or opaque. Wall thicknesses from .010", and inside diameters from 1/16" are available.



EXTENSION AND DIP TUBES

Made of Anchor Plastics Aeroflex***, the extension tube shown can be affixed to most spray can dispensers, permitting direct contact dispensing for hard-to-reach applications, such as cleaning solutions and lubricants for the electronic and fine mechanical industries. Dip tubing is extruded out of AEROFLEX-P and nylon for aerosols, lotion pumps, and similar other dispensing packages.



CLEAR-PLASTIC PACKAGING CLIPS

Contoured, clear (or tinted) plastic extruded clips enhance the appearance and improve saleability of any carded items. Costing as little as 1/8c each, clips are cut to any desired length and are snapped into the card. Available to customer specifications in quantity orders.

Anchor Plastics; specialist in custom extrusion of thermoplastics for 19 years is proud of its reputation and guarantees uncompromising quality and constant adherence to exacting tolerances.

ANCHOR PLASTICS CO., INC.

35-35 36th Street, Long Island City 6, N. Y.
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1. The maximum shock packaged article can withstand without damage.
2. The weight and dimensions of the article.
3. The maximum shock to which the article may be subjected.

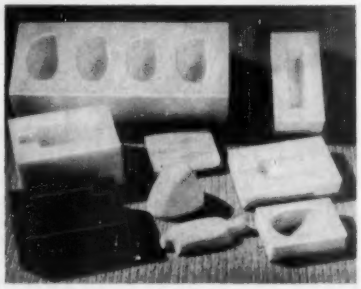
The g-factor for any article is a measure of its ability to withstand shock. In some instances, for example delicate instruments, the g-factor is a measure of the ability of its most fragile part to withstand shock.

From this information it is possible to determine the required thickness of the packaging material. To determine optimum shape and cost economy, it is still necessary to resort to trial.

Other factors to be considered in the selection of a foamed plastic for packaging are space savings in shipping, storing and inventorying, economy in loading and efficiency in use. Superior cushioning ability of the foam often reduces space requirements as much as 34%. Foamed units lend themselves to easy assembly, loading, closing. They are also outstandingly convenient for end users.

Decorating. All foams can be readily decorated by painting, dyeing or flocking. The expanded polystyrene is available in white, blue or green, and the other foams can be dyed readily in a variety of colors. Some molders introduce sequins and metallic pigments during the molding process to achieve glittering decorative effects. Embossed and attractively patterned surfaces are obtainable.

Water-base paints are recommended for the polystyrene foams, as solvent-containing paints will attack the foam. Due to its smooth surface, expandable polystyrene also may be readily stamped or printed. Colored expandable pellets providing a range of stronger colors are now available.



URETHANE FOAM items are produced in great variety by new 3-dimensional cutting process that reduces mold costs and facilitates fabrication. (*Allied Chemical Corp., National Aniline Div., photo*)

If your product can be broken, bruised, crushed or scratched...

INVESTIGATE PACKAGING IN FOAM!

SATIN-PAK®* —Trays, platforms, inserts formed to exact contours of *your* product. Satin-Pak protects with both soft cushioning and rigid strength as needed. Available in pure white (F.D.A. approved, based on prior sanction, for direct-contact packaging of foods, drugs, cosmetics), or in lustrous colors that add sales appeal and make striking displays. Satin-Pak gives your product a look of luxury, yet provides unique protection.

FOAM-PAK® —Flake-free styrofoam, electronically cut to highly exacting requirements. Low tooling cost makes Foam-Pak economical in large or small quantities.

MOLDED FOAM

Expanded polystyrene foam, expertly molded into solid platforms and sturdy shipping containers for products of every shape and size. Offers greatest protection against damage or breakage at low shipping cost.

Packaging in foam by Packaging Components offers you these advantages:

- Prevents breakage
- Eliminates costly interior packaging materials
- Cuts labor costs—easy to assemble
- Cuts shipping costs—lightweight
- Adds sales appeal to your product

Complete, coordinated packaging research, design and production—all facets of your packaging problem handled under one roof!

Write or phone for **FREE SAMPLES!**

*Made from "Xan-Foam," a product of Sun Chemical Co

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GLAMOUR PACK for utilitarian product. Acetate bubble, specially designed for swivel glides for chair legs, protects product from tarnishing and scratching. (*Acetate, Joseph Davis Plastics Co.*)



FLIP-TOP blister for brush permits examination of bristles. Formed cellulose-acetate sheet is heat sealed to printed, die-cut hang card. Bottom of blister is open. (*Acetate, Celanese Corp. of America*)



SELF-SERVICE VALENTINES are packaged in low-cost oriented polystyrene blisters heat sealed to pyroxylin-coated cards. Blister has molded design. (*Oriented polystyrene, Plax Corp.*)

Blister packs and other thermoforms

Blister packs, skin packs and formed sheet plastic containers, trays, lids and similar components have become a major new force in packaging. They provide packagers with many fresh and original approaches based on novel or functional constructions and with greatly enlivened display and self-selling characteristics. Also, new materials, equipment, techniques and innovations in the use of thermoforms are enlarging opportunities.

There are two principal reasons why sheet plastics deserve attention: (1) They provide the packager with many of the advantages found in paperboard plus the advantage of transparency and additional barrier or functional properties; (2) The newer methods of forming sheet plastics make possible a range of package shapes and sizes that had proved too difficult or costly when other methods and materials were considered.

There are three basic processes, plus numerous variations of these, available in the producing of packages and package components from plastic sheet. These are (1) *vacuum forming*, (2) *pressure forming* and (3) *sheet fabrication* (see p. 311).

Vacuum and pressure forming are quite similar in methods used and types of containers produced. In both processes the sheet is heated until it is soft and then is forced into a cavity mold or over a profile mold.

Vacuum forming employs atmospheric pressure (15 lbs. per square inch) as the molding force. Vacuum-forming machinery, dies and some of the processes are relatively simple. As a result, vacuum forming is performed by both packagers and custom formers. Vacuum-forming machines are discussed and illustrated in the article on thermoforming equipment, p. 571.

Pressure forming employs air, hydraulic or mechanical pressure of approximately 75 to 150 lbs. per square inch, although pressures to 300 p.s.i. are used in certain operations. The equipment is relatively heavy and metal dies must be used because of the heavier pressure employed. Because of the more complex know-how and specialized equipment involved, pressure forming is usually found in the custom former's plant.

The principal sheet plastics used in thermoforming packages are: cellulose acetate, cellulose acetate butyrate, polyethylene, high-impact polystyrene, oriented polystyrene, rigid and flexible vinyl. (See charts: "Sheet Plastics for Thermoforming," p. 300, and "Characteristics of Sheet Plastics," p. 310).

In addition, others being used or potentially useful in packaging applications include methacrylate, ethyl cellulose, polyester sheet, nylon, higher-density polyethylenes, polypropylene, foamed polystyrene and several combination materials.

Much of the interest in thermoformed sheet packages centers around the type of package referred to as a blister pack, bubble pack or dome pack. This package consists of a transparent plastic shell that is mounted on a paperboard card. The product to be

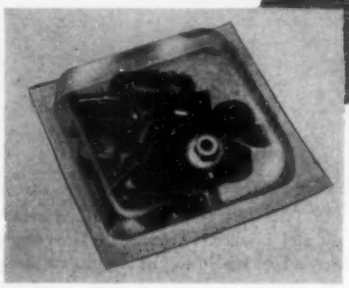


DISPLAY is white polystyrene, vacuum formed. Planned for drug counters, center is formed as a change tray. Printing is hot stamped. (*Chanal Plastics photo*)



POURING SPOUT created by unsealed space opens with finger pressure, closes on release. Package used in Europe for liquid dairy products, fruit juices. Formed from reel of thermoplastic sheet, filled and sealed with cover sheet on one machine. (*Hydro-Chemie photo*)





BETTER STOCK SELECTION, positive protection, easy opening are features of paper-backed blisters for Buick replacement parts. Imprinted, heat-sealed 300-lb. bleached kraft lid tears off easily. Because a paper is used, the blisters are 15-mil butyrate. (*Butyrate, Eastman Chemical Products; kraft, Nashua Corp.*)

packaged is inserted between plastic dome and card. (See p. 301 and p. 307.)

Plastic stock, either in separate sheets or from a roll, is fed into a vacuum-forming machine, where it is heated until it becomes soft. Then it is pulled by vacuum into a cavity mold or over a profile mold. As many as 50 or more individual blisters can be formed at one time. Moreover, a variety of patterns can be handled in a single sheet and the shapes can be varied readily by changing individual molds or dies.

When the packager receives the plastic domes, he generally employs some type of conveyor line and jig device to assist operators in filling the product into the bubble and assembling the bubble to the card.

Vacuum-formed blisters characteristically have a flanged base or edge produced during the forming operation. This flange can be stapled to a card, or it can be heat sealed to a card coated with a thermoplastic resin.

An increasing number of paperboard suppliers can furnish thermoplastic-coated stock specially designed for heat-sealed blister packages. Specially designed heat-sealing equipment and jig arrangements also have been developed to speed the operation. Of course, thermoplastic sheet can also be used as the base of the package.



FROZEN FOODS PACKAGE is vacuum formed from high-density polyethylene. Covering is heat-sealed 50-gauge polyester coated with 1 mil of polyethylene. Tear strip is ⅛-in. band of polyethylene-coated polyester imbedded in cover. (*Tray and film, Formed Container Corp.*)

Skin packaging

The so-called skin package differs from the blister pack in that the product itself becomes the die or mold. The rigid or packaged product is inserted in the bed of the vacuum-forming machine. Plastic sheet is drawn over the product and a skin-tight fit of the plastic package results.

The skin package can be: (1) heat sealed to a card during the forming process; (2) an all-plastic package, or (3) individual units that are cut apart and the skin-packaged unit mounted on a card just like a blister pack. The paperboard card is desirable in many packaging applications, because it provides the printed copy and brand-product identification so vital in self-selection merchandising. Usually the board must be perforated and thermoplastic coated. But with a film like polyethylene-coated polyester, plain board is used. The all-plastic skin package, of course, excels in streamlined display and product visibility.

Skin packaging lends itself to application in the packager's plant, but in some cases it is done by the custom former. Generally, soft or very heavy products do not lend themselves to skin packaging. Skin packages use relatively thin gauges of sheet stock; they lock the product and component parts securely in place. They provide excellent merchandising for hardware, tools and products sold in sets.

Contoured containers

In addition to blisters and skin packages, there is a third type of thermoformed-sheet container that deserves careful study. This is the plastic box, tray, cylinder, bottle or a specially contoured container. From a construction point of view, this type of container offers exceedingly wide freedom in design. The container can be very small, very large, long, flat or intricately detailed with formed-in compartments, dividers, platforms or pockets. The closures can be slide covers, snap covers, hinged covers, friction fits and many other standard and novelty types of lids. Variety is the strong point of the thermoformed-plastic-sheet container, and packagers who have special requirements in regard to product size, shape or the need for novelty should study thermoformed packages now on the market.

Thermoformed plastic sheet also performs important chores where signs and displays are concerned. Replicas of packages can be reproduced with great fidelity and in very large or small sizes. Designs in color can be preprinted in a distorted pattern on the plastic sheet and the result after the forming operation is three-dimensional realism in every detail. Packagers will do well to study some of the printing techniques used in the thermoforming of signs they have.

six success packages



VICKS Inhaler packed in a **SNAPLAX** — Plaxall's double undercut blister "snaps" into a diecut display backing so as to eliminate sealing.



CUTEX lipsticks by Northam Warren are vividly displayed in these beautifully contoured transparent SLIDEPLAX packages.



ISODINE bottle encased in one piece fold-over blister — this stand-up, see-through package "sells" from both sides.



LEHN & FINK packs six Noreen hair rinses in this acetate SLIDEPLAX — slide-out card permits individual dispensing.



BECTON, DICKINSON thermometer and case are held firmly in snap-fit precision formed blisters for maximum protection.



BRIDGEPORT METAL flashlight and battery combinations are readily accessible for inspection or testing in sturdy SLIDEPLAX packages.

All pressure-formed in plastic by Plaxall

Plaxall, with nearly a quarter century of pressure-forming experience, now combines "in plant" sheet extrusion with high speed thermoforming to offer an unlimited range of formed plastic packaging at lowest cost. Experience counts in plastics...when you need thermoformed packaging, be sure to consult Plaxall, the Pioneer in pressure-forming!

For all types of formed plastic products . . . call or write

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Sheet plastics for thermoforming*

Material[1]	*Forming characteristics*	*Gauges used, inches*	*Sq. in. per lb. 10 mil g.*	*Price*[4] *per lb.*
Cellulose acetate	Forms readily with vacuum or pressure on simple equipment. Cycles short and economical. Sheet forms at 300 to 325 deg. F. Ring assist with male mold and plug assist with female mold help produce uniform wall thickness.[2] Best results obtained by heating sheets rapidly with high-temperature heater (1,000 deg. F.).	0.005 to 0.020	2,100	$0.80 to 1.00
Cellulose acetate butyrate[3]	Forms readily with vacuum or pressure on simple equipment. Techniques well developed. Cycles are short and economical. Sheet forms at 285 to 320 deg. F. Resists webbing and blush.	0.005 to 0.020	2,250	0.85 (0.015 gauge)
Flexible (conventional) polyethylene	Forms readily. Relatively sharp melting point. Low hot strength. Slow to heat and slow to cool. Heating cycle must be precise. Cooled molds minimize shrinkage. Sheet forms at 350 to 375 deg. F. Heaters in 1,000 to 1,200 deg. F. range recommended. Good for skin packs.	0.003 to 0.030	3,000	0.45 to 0.60
Rigid (linear) polyethylene	Forms using all known techniques. High heat (1,100 deg. F. or higher) for fast cycles. At this temperature, pre-heat time is approximately ¾ sec. per mil thickness. Vacuum holes must be small as possible (0.015 dia. max.). Mold temperatures must be held to 150 to 160 deg. F. Rigidity facilitates cutting and trimming.	0.010 to 0.030	2,900	0.48 to 0.70
Polystyrene, modified	Excellent for difficult draws and where detail is required. Sheet temperatures of 275 to 350 deg. F. are used. Vacuum of 28 in. is best, but some parts can be formed using vacuum as low as 10 in. Conventional equipment used. Trims easily. Pre-heat time and temperatures vary.	0.010 to 0.040	2,600	0.48 to 0.70
Polystyrene, oriented	Low-detail designs can be formed by conventional vacuum- or pressure-forming methods. Sheet forms at 250 to 300 deg. F. To attain maximum benefit of high-yield, low-cost properties, contact heating-air pressure systems are recommended. This provides maximum design potential for rigidity in thin sections at high speed. Trapped sheet method is used to maintain orientation.	0.003 to 0.010	2,680	0.48
Polystyrene, foamed sheet, extruded	Can be vacuum or pressure formed, preferably using 2-side heating. Heater surface temperature should range from 900 deg. F. on top to 450 deg. F. on the bottom. Drape forming usually best, except on deep parts where female mold and plug assist should be used.	0.010 to 0.040	15,000	.90 to 1.60
Polypropylene	Forms all techniques. High heats (1,000 to 1,400 deg. F.) for rapid cycles. Pre-heat to reduce cycle time. Double bank heaters recommended. No. 80 drill for vacuum holes. Mold temperatures should range 160 to 200 deg. F. Trim after cooling. Good for skin packs.	0.003 to 0.030	3,060	0.71 to 0.94
Flexible vinyl (cast, calendered or extruded)	Low-detail designs formed with conventional methods. Forms at 260 to 280 deg. F. Heat cycle requires close control. Provision for rapid and complete air evacuation is important. Close detail requires special techniques. Excellent for skin packaging.	0.005 to 0.010	2,000	0.69 to 0.87
Rigid vinyl copolymer (calendered or extruded)	Forms readily. Temperature range 280 to 310 deg. F. Close mold temperature control important for good results. Pre-heat time can be short and wide pre-heat range can be employed. Sheet is readily printed and is easiest to form without defacing printing. Good detail can be retained. Excellent for skin packaging.	0.010 to 0.020	2,000	0.62 to 0.81

* Based on information from producers and users of thermoplastic sheet. For specific data, consult the producers of materials.
1 Materials listed here are those now used most extensively in vacuum or pressure-forming packages and package components. Other materials now being used or potentially useful include: acrylic, ethyl cellulose, polyester sheet and nylon.
2 This statement, in general, is also true where the forming of other plastic sheets is concerned.
3 Cellulose acetate propionate has similar forming characteristics. Reportedly it is low in plasticizer content and thus can be used for packaging other plastics or materials where migration might be a problem.
4 Figures are for clear or normal grades generally used in package-forming applications. Estimates are intended solely as relative guide or bench-mark to be used with other factors, including gauge, yield, performance and ease of forming. Estimates are, in general, based on maximum-quantity quotation and were current only at time of preparation. Where range of quotations is given, this indicates different estimates prevail for variations in gauge and type of sheet stock.

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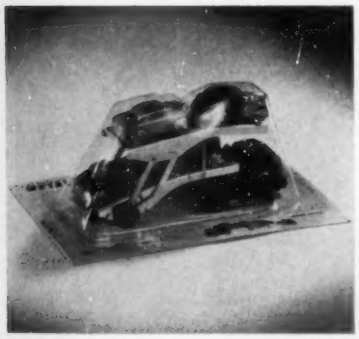
Blister-pack assembly methods

by Carl Middleton, Jr.*

One of blister packaging's greatest problems today is the absence or inadequacy of communication between thermoformers and their customers. This can be attributed directly to the industry's newness and lack of standards, its failure to educate its customers and the shortage of reliable information for the customers' reference.

In this brief discussion, an effort will be made to give the newcomer to this new and sales-stimulating method of packaging some idea of the different styles involved and their advantages and disadvantages. With these few facts in mind, the potential customer should be able to build a greater knowledge of this technique by further questions and to understand and compare more easily his suppliers' presentations.

Single laminated blister



SINGLE LAMINATED blister used for Barclay Mfg. Co. toys because of simplicity and ease of assembly.



FIGURE 1—Single laminated blister

By far the most popular style of blister pack today is the *single laminated blister*, a blister assembled to the face of a single paperboard panel enclosing merchandise, as in Fig. 1. Adherence usually is achieved by heat-activated coatings on the plastic or the paperboard, usually the latter; or, staples may be used. Some points of advantage and disadvantage follow.

Advantages:

1. Generally the lowest-cost method of all styles. However the packager must have sealing equipment, have sufficient packaging volume to buy such equipment or have sufficient budget to resort to contract packaging.
2. Is adaptable to assembly on all types of sealing equipment, heat against blister flanges, heat from behind card and electronic sealing.
3. Can be assembled by stapling or wire stitching with lightweight merchandise.

Disadvantages:

1. Has very limited re-use value.
2. Not the most successful style for large, high and narrow, or heavy products.
3. Staple holes fracture plastic and provide start for easy tearing.

Double laminated blister—two variations



FIGURE 2—Double laminated blister



DOUBLE LAMINATED blister folder—without adhesives—facilitates Colgate's assembly of different shaped tie-ins. Strength plus dramatic display provided for large items.

The double laminated blister is the most versatile of blister packages—a package style peculiarly adaptable to the development of a new product from market tests to mass production.



OPPOSING blisters protruding from each side of double card provide depth plus full visibility for Sterling Plastic Co. sharpener.

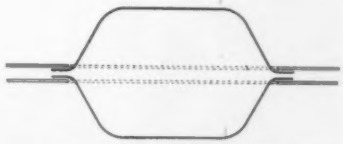


FIGURE 3—Back-to-back blisters

It can be constructed of a card folded once at a cut score (crease score will not fold sufficiently flat) into a booklet form with a die-cut opening in one panel for a single blister (Fig. 2) or in each panel for opposing blisters (Fig. 3). This latter technique provides a very interesting effect—with the product appearing to be suspended at the middle and with half protruding into a form-fitting blister on each side of the package. The same structures can be achieved with separate paperboard panels. The components of either of these packages can be assembled by means of a variety of techniques, all using adhesives applied to the inside surfaces of the paperboard stock.

Advantages:

1. Can be assembled by hand with (a) wet glue, screened or roller-coated or (b) contact self-adhesive (self-adhering latex), or (c) by stapling.
2. Can be assembled by semi-automatic machines, by electronic or thermal conducted heat.
3. Most durable of all blister packages.
4. Adaptable to packaging of heav-

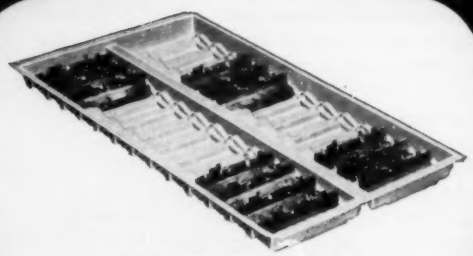
*Plastic Artisans Div., The Warner Bros. Co., Port Chester, N.Y.

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Grace, beauty and luxury appearance are combined in Paper-Mate's box inserts thermoformed from velour flocked polystyrene

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Carded blister pack with "standing" feature displaying Helene Curtis's Endac

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ier products than any other blister package.

5. When used with two opposing blisters, one protruding from each side, permits the packaging of merchandise too large to be covered by one blister; also permits the packaging of heavier objects with greater safety.

Disadvantages:

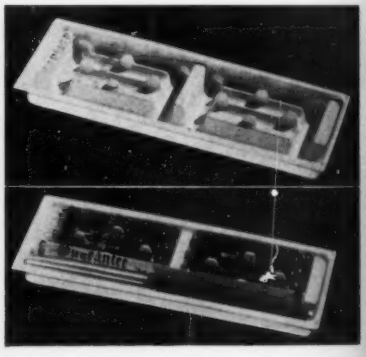
1. Generally more expensive than single laminated blisters because of extra material and labor costs.
2. Has very limited re-use value.
3. Difficult to adapt to automatic paperboard feeding mechanisms in automatic assembly lines.

Separate panels. These have the same advantages and disadvantages as the *folded panel style* except that separate panels are readily adaptable to automatic paperboard feeding and handling equipment.

Blisters with sliding closures—two variations

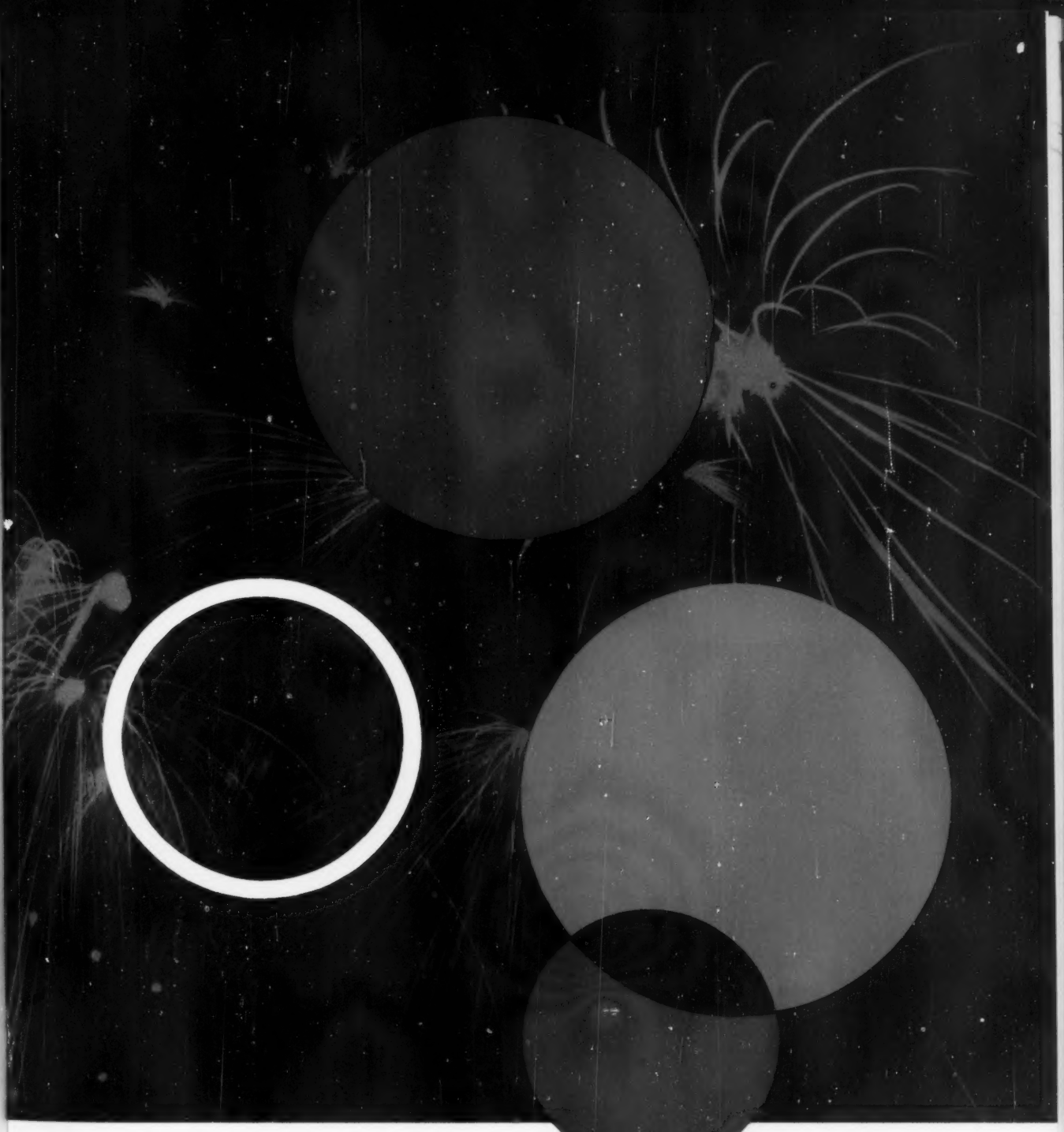


FIGURE 4—Slide-cover blister



SLIDE COVER thermoform for Wearever Ink Cartridge Pen and Refills holds and displays items; serves as handy container.

Demands for the greater sales appeal of re-usability in thermoformed packages brought about the creation of *slidecover boxes*, the first style to appear on the market, and *slide-off* blisters, the less expensive and more versatile of the two. Although the contoured blisters in either style can be identical, their difference lies in the method of attaching the cover. The SCB (Fig. 4) is comprised of a blister with flat flanges and a plastic slide cover with track edges on two opposing sides into which the flanges of the blister will slide. The slide-off



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VYNEX*	CELLULOSE ACETATE BUTYRATE
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This experience is increasingly called upon to give your package or product a better appearance and more endurance — all important factors in the more and more critical standards demanded by today's markets.

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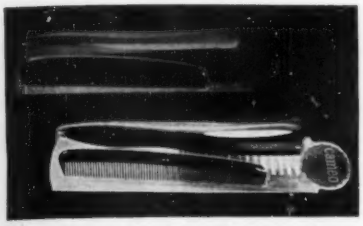


to create a distinctive container in the modern manner for cosmetics and a host of household and personal products. A case in point: the popular roll-on bottle in linear polyethylene . . . handsomely designed to meet the closest orifice and ball-seat tolerances.

Quality packaging for added sales appeal has been the specialty at Wirz for 125 years. Today, Wirz knows what plastics can do. Let a representative work with you to create an exclusive container design . . . or adapt a standard Wirz container to your special needs.

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blister (Fig. 5) has tracks folded on two opposing flanges into which inexpensive die-cut paperboard covers of numerous designs can be inserted.



SLIDE-OFF blister's mechanical characteristics make it practical for larger items like this Tek-Hughes brush and comb set.



FIGURE 5—Slide-off blister

Advantages–Slide-cover blisters:

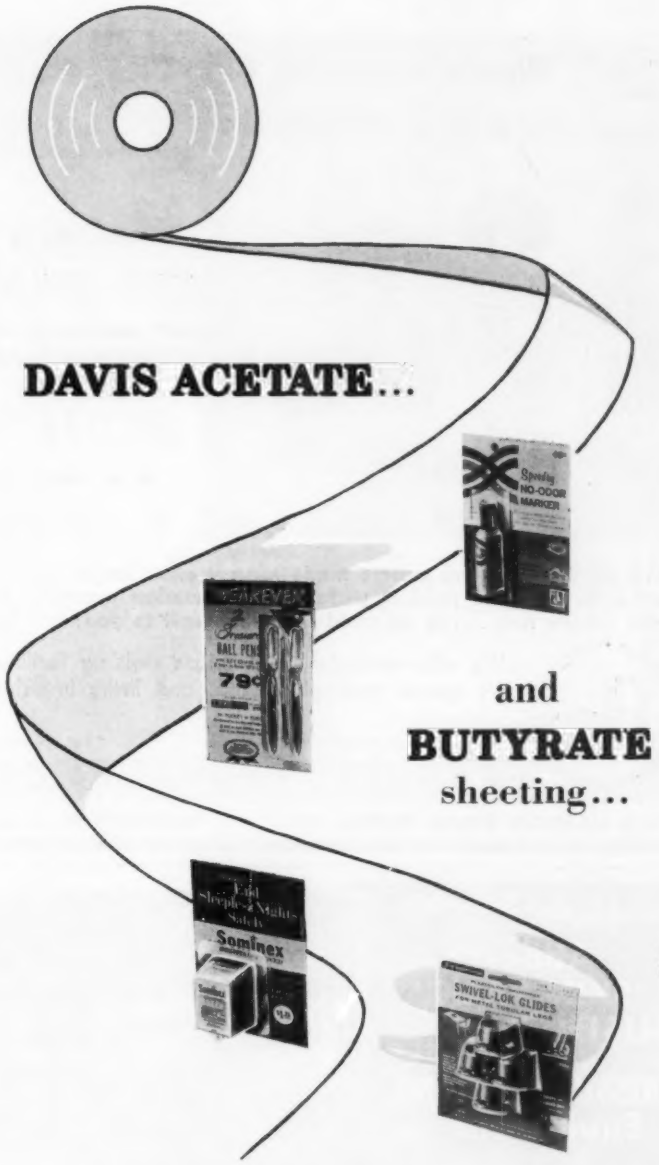
1. Can be transparent from all directions.
2. Can be printed on transparent plastic cover.
3. Re-use package for products to be dispensed part at a time with balance protected for future use.
4. Adaptable to holding several identical products or sets of related different products in separate form-fitting pockets.
5. Small units of this style generally are easier to assemble than small units of slide-off blisters.
6. Products that tend to bulge or spread the blister in this style tend to tighten the cover of the style and make it more secure–up to the strength of the cover track.

Disadvantages:

1. Generally the most expensive blister package.
2. Not yet adaptable to automatic or semi-automatic assembly.
3. Large units of this style may warp and twist during handling, becoming difficult to assemble and offering less security to product unless heavy and more costly materials are used.
4. Cover can be bulged away from flanges where not retained by tracks. This difficulty can be improved upon or overcome by insertion of paperboard inside cover with resultant increase in cost and loss of transparency in cover.

Advantages–Slide-off blisters:

1. Generally the least expensive



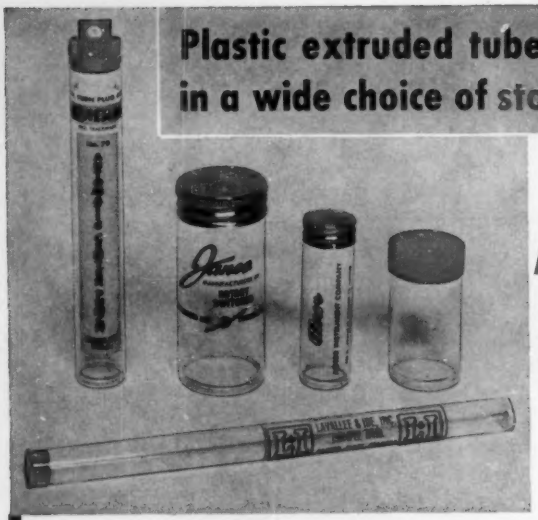
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style of re-use blister because of less-expensive die-cut paperboard closure.

2. Package for products to be dispensed part at a time with balance protected for future use.

3. Adaptable to holding several identical products or sets of related different products in separate form-fitting pockets.

4. Large units of this style generally are easier to assemble than large units of side-cover boxes.

5. This style more successful in the larger units than SCB because of rigidity that can be added by use of heavy paperboard.

6. Can be assembled to a variety of special paperboard cover designs and display units, using the following principles or variations:

- Ordinary rectangular cover or cut-out flap
- "T" card for hanging on racks
- One track on edge of display unit and the other in a die-cut slot
- Both tracks on die-cut slots.

Disadvantages:

1. Generally the most expensive blister package, next to slide cover boxes.

2. Not yet adaptable to automatic or semi-automatic assembly.

3. Small units of this style frequently are more difficult to assemble and offer less security to products than slide-cover boxes.

4. Products that tend to bulge or spread the blister of this style separate the side tracks, making the cover less secure.

5. Transparent or other plastic covers for this style would require either extra-heavy material or formed-structural reinforcement ribs to provide sufficient rigidity to prevent buckling out of tracks. Either would make this style more costly than a slide-cover box.

6. Cover can be bulged away from flanges when not retained by tracks. However, this characteristic improves in proportion to any increase in thickness of paperboard cover with resultant increase in cost.

There are many possible variations of the four general styles described here. However, if the packager has gained a basic understanding of this increasingly popular concept of packaging, he will be in a better position to deal with his problems of blister-package design and procurement. Then some of the difficulties stemming from inadequate customer-supplier understanding can be avoided.

Factors affecting blister-pack heat seals

by Stanley R. Rosen*

The heat-seal blister package has tremendous visual appeal and wide usage on the basis of functional and economic advantages.

Heat sealing is an economical and practical means of blister closure. But what is even more important is that heat sealing offers superior performance and neat appearance. Also, large or small production can be accommodated. Capital outlays can be held to a minimum until the extent of the market has been judged, at which time more productive equipment can be purchased. (See also "Blister Pack Assembly Methods," p. 301.) The packager should understand the factors contributing to strong blister seals and instruct his vendors and employees in the simple tests and techniques to insure success.

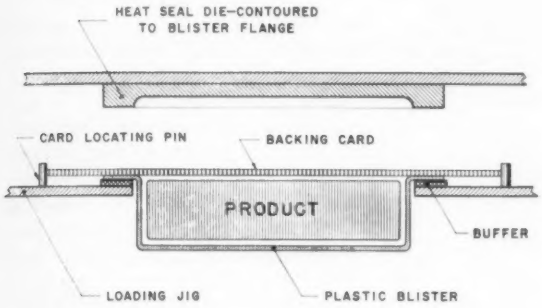


FIGURE 1
Typical blister-sealing jig. Blister is being sealed through the board side. *(Tronomatic drawing)*

Blisters of any commercially available plastic (see table on p. 300) can be heat sealed to cards providing the cards are suitably coated with a compatible heat-sealed coating. Polyethylene, however, can be sealed to uncoated stock. Mold release sprays may be used by the plastic fabricator as an aid in stripping off the formed blister from the mold. Traces of mold release on the blister flanges can create a barrier between coating and card, possibly preventing the formation of a strong bond. The use of such forming aids should be restricted.

Good packaging practice and plastic economy require a compromise in blister flange width. In general the flange of a blister can be die cut with respect to blister profile to a tolerance of plus or minus 1/16 inch. In addition, a 1/16-in. radius generally is required at the juncture of flange and blister profile. Experience indicates that 3/16 in. of circumferential sealed flange will secure most packages. This, plus 1/16-in. die-cutting error and a 1/16-in. flange radius will dictate a minimum of 5/16-in. flange.

Heat seal coatings for each type of plastic are available from many adhesive suppliers. Some coatings may be sprayed, screened, or applied with a modified gluing machine. The wet, coated cards are dried in a heat tunnel before stacking. Commercial coatings are applied by specialists of the printing industry who subcontract this work from the card printers. Most coatings have highly flammable chemical carriers which require handling with respect and care. Problems have appeared for inexperienced "coaters" who have stacked incompletely dried cards on skids for storage to find that they have blocked into a solid mass.

The paperboard stock to be printed as blister heat-seal cards should be specified as to the end use. Blister sealing can be accomplished on almost any thickness of board stock, with the majority of cards in the 0.020- to 0.030-in. range. However, successful seals have been made on stock as thick as 0.125 inch. The thicker boards sometimes are produced by gluing printed top paper liner to board stock. The glue must be heat-resistant; otherwise the printed liner may draw away from backing board during the heat-seal operation.

The paper face of the card is manufactured with either clay, patent or "chrome" coating. This coating is on the card before printing and should not be confused with the heat-seal coating which is applied after printing. Clay-coated board gives the most consistent seals, and is by far superior to any other type of card. Chrome-coated board appears to have good heat-sealing qualities in many applications tested. Patent-coated board seems to have good seal characteristics immediately upon process-

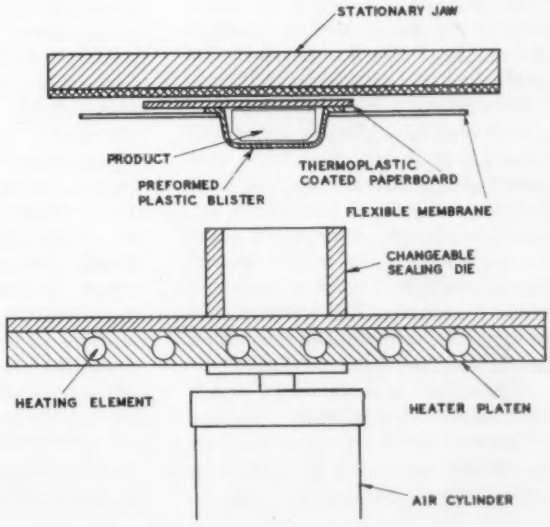
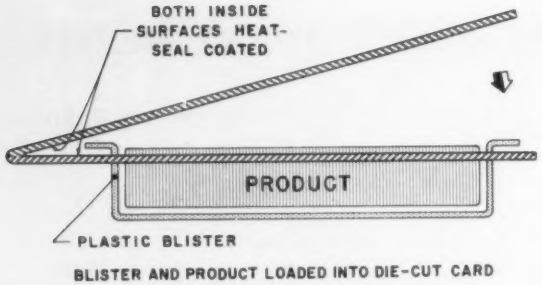


FIGURE 2
Typical arrangement for sealing blister through the plastic side of the blister pack. *(Packaging Industries drawing)*

*Chief Engineer, Tronomatic Corp., New York City.



BLISTER AND PRODUCT LOADED INTO DIE-CUT CARD

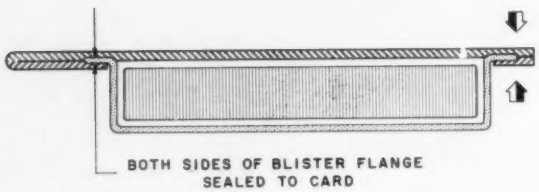
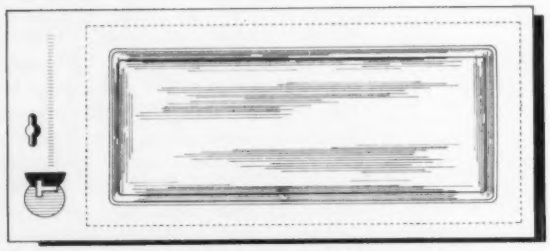


FIGURE 3
Method of heat-sealing the foldover card used in the packaging of heavier products, where extra strength is needed. (*Drawing by Tronomatic*)



TOP VIEW OF FINISHED BLISTER PACK

ing, but the seal deteriorates quickly in time. This board should not be used unless thoroughly tested.

Clay-coated board now on the market is primarily designed to be used in the manufacture of paperboard boxes. The various paper mills use a multitude of binders to anchor the clay to the board face and apparently these binders affect sealing characteristics of the board. Test of heat-seal characteristics of a new board should be the first step before printing.

Inks. Boards for use in blister heat sealing may be printed by any of the standard processes. The inks used should be specified as "heat-seal inks" to prevent "blushing" under heat and should be free of waxes and the like. Many ink manufacturers have specific formulas which have been tried and tested for sealing. These inks should be applied as directed, and then tested by the user on printed proofs.

Where one or more colors of ink are overprinted, the resulting deposit of heavy thick-printed surfaces should be avoided as an area to be used for sealing. Cross hatch or Benday design is preferred if a seal must be made on a printed surface, so that some of the sealed area is clear of ink. Occasionally the package design can incorporate a white background under the flange. This condition is excellent as the printer may use his standard ink for the artwork and the sealed area is completely free of contamination. The card design should not closely outline, in white, the contour of the blister, for any small shift of blister or card would be easily discernible to the eye.

Heat-seal equipment. A good heat seal of blister to a card requires that the temperature of the heat-seal coating be raised sufficiently to bond to the plastic. Heat can be applied through the card (Figure 1) or through the plastic blister (Figure 2) for either method will produce a seal; each has different characteristics and advantages. In some special cases, electronic sealing may be the preferred method. (See also article on heat sealing in Section 12.)

The temperature required for sealing varies with sealing time, pressure and chemistry of the heat-seal coating. Generally the range is between 275-400 deg. F., depending on the variables. Temperature regulation of the sealing die is not critical, for a change of plus or minus 15 deg. F. will produce similarly good results.

The time required for sealing can range between 1 and 8 seconds, depending on materials to be sealed and heat-sealing method used. Sealing is usually "jigged" on tooling which produces many packages at every cycle. Material handling and loading can consume two to four times the sealing time, so rapid sealing does not always mean greatest productivity. On the other hand, jigs or tools on conveyors are available so machines with fast cycles can be used to produce packages at a high rate.

Tooling. All commercial heat-sealing machines provide a means of varying and controlling time, temperature and pressure. However, jigs or tooling (e.g., Figure 1) are needed to start production for each style of blister and act as a locating guide for cards. A heat-seal die shaped to the blister flange is mounted to the heated platen of the machine, allowing heat flow to be directed only to sealing areas.

To size the tools properly, the jig maker must have production cards and blisters. Cards used for designing tooling should be die cut with the same dies used for the production run in order that the cards will slip into the jigs snugly, without undue looseness or tightness. The blister flange should be contour die cut to 5/16 in. so the sealing die follows the outline without noticeable overlap.

The face of the tooling (when blisters are sealed through the board) is coated with a buffer material. This material can be of any heat-resistant material such as silicone sponge rubber, Teflon-impregnated fibreglass, or thin stainless steel Teflon-coated. The buffer will not adhere to the coated card. Thus build-up of coating is avoided to prevent tearing and defacing the cards. The buffer material can yield under the sealing pressure, equalizing the load all around the flange, and creating a uniform seal.

Design factors

Blister packages to be heat sealed should be designed with some thought of the sealing process, and of its advantages and limitations:

1. Blister flanges should not be situated closer than 1/8- to 3/16 in. to the

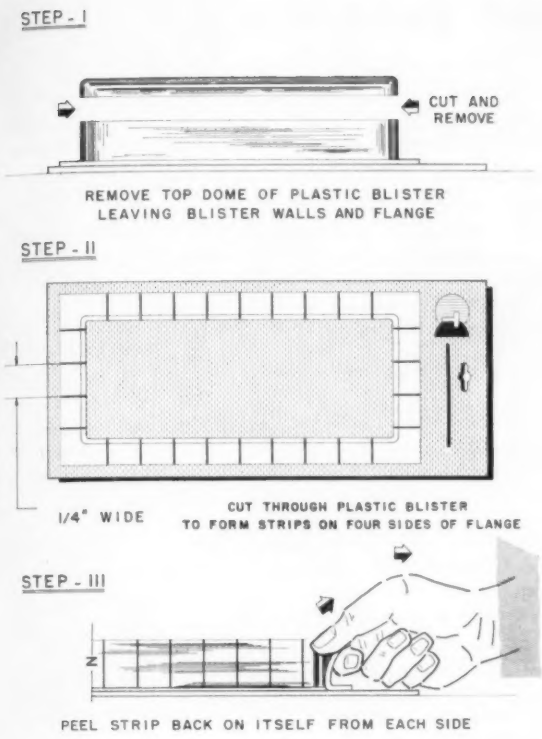


FIGURE 4
A quality-control check on the variables of a blister-sealing operation. Firms establishing these routines have developed very successful blister-packaging operations at a highly profitable level. *(Tronomatic drawing)*

edge of the card. If the blister extends to the end of the card, die-cutting error—in card, blister or both—can allow plastic to project beyond the card edge. Sharp plastic protruding past the card edge may cut anyone handling it, or create an unfinished look about the package. Close proximity of the blister flange to the card edge can increase tooling cost, for a retracting card guide is necessary to allow the sealing die to approach the edge.

2. Rectangular seals can be designed so the longest seals are perpendicular to the grain of the card. Cards tend to warp in the direction of grain; if the shortest seals are made in this direction, curling will be minimized.

3. In designing a package which must contain a heavy item (¼ lb. or more) the heat-seal foldover card (Figure 3) offers the strongest and most secure package. It is made by sandwiching a blister between the die-cut top card with an opening for the blister and a solid backing card. Both are heat-seal coated on the inside surface. Resulting seal bonds card to card; the blister flange is sealed to both halves of the card.

4. Many packages require a circumferential (picture frame) seal and the sealing of various compartments making up the blister. An analysis is necessary to avoid making heavy, long seals within the blister's perimeter. Very often "dot" seals or short bar seals will secure the merchandise in the blister compartments. Long, heavy seals may cause card warpage.

Testing

Quality control of blister packages requires that all the variables stated above be checked before the "start up" of a blister-sealing operation. Packages to be tested should be prepared as illustrated in Figure 4 and be peeled back in the four directions as shown. The peeled strips can indicate the quality of the sealed package as evidenced by the type of residue adhering to the flange. When the only visible residue is ink deposits, it may be possible that a change to another type of heat-seal ink will provide good sealing. If a white powdery deposit appears on the flange, adhesion is probably to the top clay binder and not to the paper fibres. This type of seal is feeble and is not desirable for most applications. The best result is indicated when tears in four directions each show adherence of the paper liner and the core of the paperboard.

Tests can be made immediately after sealing but delayed results may show up two or three days after sealing. A waiting period is recommended.

Many clay-coated boards show a good adherence in two parallel directions and either no adherence or only a surface clay adhesion in an opposite direction. This can result in a strong seal in the direction of the grain and a weak one perpendicular to it. Paperboard stock being tested may have to be abandoned for a different type.

Many experienced packagers will test a package by striking it hard, paperboard side down, on a table in a sweeping blow. A poorly sealed package will not take the resultant shock and the blister will fly off without any marks of sealing or paper adherence. This type of shock when experienced by a solidly sealed package will cause the plastic to break, or the flange to break away, indicating signs of paper adherence. This drastic test will show signs of ink or paper failure many days before these faults will show up under natural conditions.

If *tooling or equipment* is suspected as the cause of improper sealing, it can be removed as a variable. Keep all conditions constant and insert a piece of "test-coated board" into the tooling. Testing board is plain white coated board of known sealing characteristics which can be obtained from machinery or coating manufacturers. If this board seals properly to the blister, then the equipment can be removed as one of the variables. If improper seals occur, equipment and methods are suspect. Poor seals may be the result of mechanical interference, incorrect or insufficient temperature or pressure regulations. Too much heat or pressure—on cards sealed on the board side and through the board—shows up on the blister flange as a severe deformation with the sharp transference of the buffer texture to the blister flange. However, just the opposite is true for blisters sealed through the plastic blister for, in this case, the texture of the glass cloth is intentionally transferred into the flange of the blister. Too much heat in this type of seal is revealed by a "bubbly" effect.

The most successful blister packages are carefully designed with proper consideration to basic component requirements as reviewed here. Simple test routines should be developed by packagers to insure that supplier and in-plant operations maintain required standards for the best blister package components and seal.

Characteristics of sheet plastics*

Types of material and general characteristics[1]	*Packaging uses*
ACRYLIC (methyl methacrylate). All colors, most commonly in colorless transparent, with unsurpassed brilliance and clarity. It has luster with better lasting qualities than styrene. Excellent dimensional stability. Water absorption higher than styrene, lower than acetate. Excellent outdoor exposure stability. More flexible and less brittle than styrene, although not so tough as cellulose materials. Adequate heat resistance (160-180 deg. F.). Excellent odor and excellent taste characteristics. Excellent resistance to dilute acids, alkalies and alcohols. Affected by lower ketones, esters, aromatic hydrocarbons, strong acids and alkalies.	Fabricated or formed transparent containers or displays.
CELLULOSICS (cellulose acetate and cellulose butyrate, cellulose triacetate). Colorless transparent; wide color range. Excellent retention of clarity and transparency, or of color, in service. Moderate resistance to scratching. Good dimensional stability. Poor moisture barrier. Good strength properties. Heat resistance generally adequate. Excellent fabricating properties. Heating required for creasing, folding, etc., except in very soft formulations. Excellent drawing and forming characteristics. Cements easily. Takes printing, marking. Satisfactory odor and taste characteristics for most applications. Resistance to most oils, greases, weak acids, alkalies. Good resistance to hydrocarbons, poor to lower alcohols, ketones, esters.	Rigid transparent and colored boxes, tubes, covers and displays. Vacuum or pressure-formed containers, blisters, bubbles, skin packs.
POLYETHYLENE. Natural color, slightly cloudy, translucent. Polished sheets exhibit better clarity. Excellent dimensional stability under humidity changes. Very flexible over a wide temperature range down to —70 deg. F. Very low moisture absorption. Odorless and tasteless. Resistance to most organic and inorganic solvents. Not resistant to hydrocarbons, oils and greases. Good resistance to acids, alkalies below 140 deg. F. Excellent electrical properties. High rate of gas permeability to oxygen, carbon dioxide, etc. Newer, higher-density polyethylene offers greater rigidity and better barrier properties.	Food and drug containers. Cap liners. Drum liners. Vacuum-formed containers.
POLYPROPYLENE. Transparent to translucent. Complete color range. Durable luster. Excellent dimensional stability. Water absorption nil. Excellent strength. Heat resistance to 300 deg. F. Fair outdoor durability. Excellent water barrier. Excellent fabricating properties. Readily drawn or thermoformed. Takes printing and marking. Difficult to cement. Excellent odor and taste characteristics. Resistant to common oils, greases, alkalies, acids.	Fabricated or formed containers and displays: boxes, cups, trays and the like.
POLYSTYRENE MODIFIED (high-impact alloyed polystyrene). Complete range of opaque and translucent colors. Surface available in matte or gloss finish. Will scratch fairly easily. Low specific gravity. Excellent dimensional stability. Very low water absorption. Adequate heat resistance (180 deg. F.) for most packaging. Becomes brittle at low temperatures. Excellent odor and taste characteristics. Can be readily vacuum or pressure formed. Can be printed. Unaffected by common acids, alkalies and alcohols. Poor resistance to petroleum derivatives and organic solvents. Approved for contact with fresh meats.	Formed rigid containers, such as boxes, shaped trays for baked goods, poultry, produce and other items.
POLYSTYRENE ORIENTED. Transparent; excellent optical clarity. Tough even in thin gauges. Low specific gravity for light weight, high yield. Biaxially oriented sheet has excellent dimensional stability and shape retention, even under tension and in range of high and low temperatures. Excellent rigidity. Tends to brittleness under certain conditions. Can be vacuum formed, but trapped sheet forming at temperature of 250 to 300 deg. F. and pressure of 300 p.s.i. is recommended. Odorless. Tasteless. Nontoxic. Greaseproof. Water resistant.	Snap-on lids for paper and aluminum containers. Containers and trays for prepared foods, meat and produce, candies and condiments. Platforms and other formed components.
VINYL CHLORIDE AND COPOLYMER. Good retention of clarity and transparency. Surface scratches fairly easily. Low water absorption. No warpage due to water absorption. Good moisture barrier. Embrittles at very low temperatures. Good dimensional stability. Permanent bonds secured by heat and solvent sealing. Good strength properties, somewhat better than cellulose materials. Heat resistance adequate. Excellent fabricating properties. Excellent hot drawing. Takes printing, marking well. Excellent resistance to strong acids and alkalies, alcohols, oils and greases. Attacked by some organic solvents.	Rigid transparent boxes, tubes, drawn covers and display components. Vacuum-formed containers and liners. Pre-printed vacuum-formed displays, package replicas, emblems, etc.

* Manufacturers of these materials are listed in the Buyers' Directory at the back of this book under "Plastic Sheet." Also consult articles in this section for additional information.
1 For materials under 0.003 inches in thickness see "Properties of Packaging Films," p. 131.
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Fabricated sheet packages

by Warren Weinberg*



SIFT-PROOF container made of semirigid plastic has permanent snap-locked top with pouring fitment. Provides ease of use—and showcase visibility for attractive products. Bottom disk permanently locked in. Can be decorated and labeled with multicolor flexographic or screen-process printing. *(J-E Plastics photo)*

The original "glamour package"—the fabricated container of sparkling clear acetate—is still, after a quarter century, a preferred showcase which displays luxury items at their best and turns the most mundane product into a gift. What's more, as a result of recent technological advances the semirigid transparent container is finding entirely new markets.

Containers of fabricated plastic sheeting were, for many years, made exclusively from premium-grade cast material. Recently, however, an increasing volume of less-expensive extruded sheeting has been used to create semirigid transparent packaging which is economically feasible for low-cost items.

Sheet-fabricated packages are semirigid and offer excellent strength and protection. The material used is flat sheet, normally one of the cellulosics and, most often, cellulose acetate which may be transparent or in a full range of colors. This particular material is popular because of its dimensional stability and its excellent surface for printing, stamping and screen printing. It has satisfactory odor and taste characteristics suitable for most packaging applications, with F&DA-approved material available for those applications in which F&DA standards are critical.

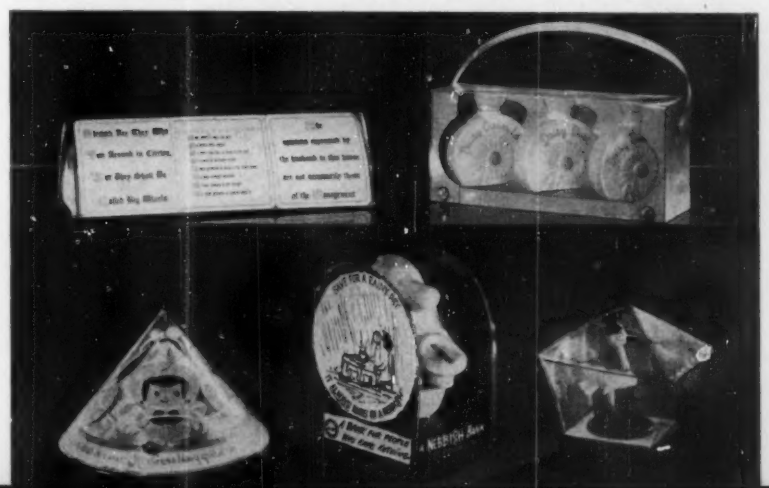
The weight, or gauge, of the flat sheet normally required for the vast majority of packages is 0.0075 inch. However, lighter gauges such as 0.005 and heavier materials in 0.010, 0.015 and 0.020 gauges are sometimes indicated for special-purpose packaging. Joints, closures and seams, for example, are effected by electronic or chemical processes and carefully specified gauges may be indicated to achieve the desired characteristics.

Packages produced by fabrication are self-supporting and retain their shape indefinitely. One of the important advantages of this style of packaging is that it can be adapted to a product without requiring an investment by the user in dies or molds. In addition, short or long runs are feasible at low cost per unit.

The modern fabricating sheet plant, to compete with other types of packaging, has introduced considerable automation in manufacture. An example of the advances in mechanized production is seen in the machine that makes rectangular plastic boxes and covers. Here, the flat sheet is fed from huge rolls through one end of the machine which, in progressive stages, prints, die-cuts, forms, seals corners and ejects the completed box at a rate of one every six seconds.

In line with this streamlining, new equipment is now available which permits high-speed printing in three colors at the same cost as for one color stamped in conventional processing. While the equipment must be adapted for this purpose, the advan-

SPECIAL FORMS. Provocative package designs are made from sheet plastic. Each can be specially suited to product. Among the shapes are: varieties of half-round, pointed dome, lantern, oblong with plastic handle eyeletted to body. *(J-E Plastics photo)*



*President, J-E Plastics Mfg. Corp., New York City.

tages in terms of improved graphic art are limitless. A natural application for this multicolor process lies in the fabricated acetate cover which daily is finding new markets in combination with both paperboard and plastic trays.

Sheet plastics lend themselves to combination with other materials such as decorative papers mounted on heavy paperboard, foils, rigid plastics, fabrics, straws, metal, wood, etc. Carrying handles, product supports and dividers frequently are required and are obtainable at reasonable cost. The great flexibility in design accounts for the infinite variety of shapes and applications.

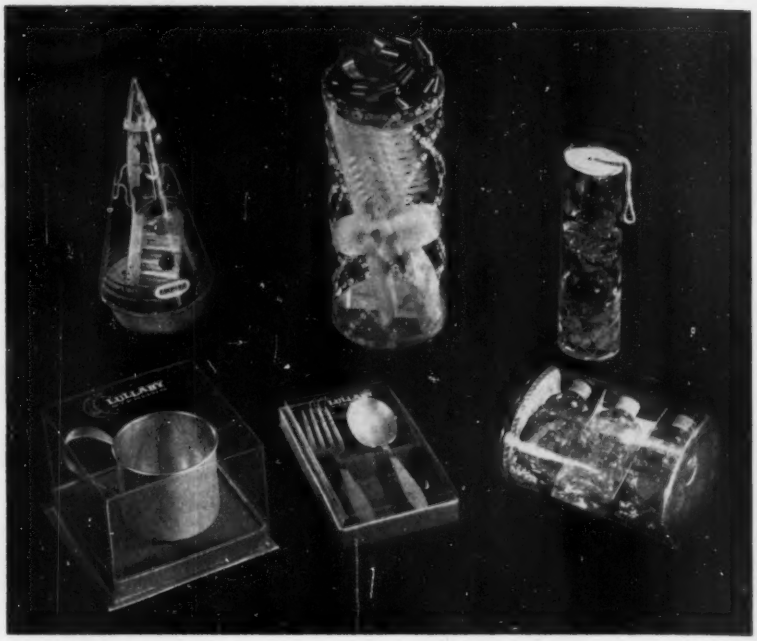
Sift-proof containers. The good looks and self-selling advantages of semirigid plastic packaging now can be put to work for the hard-to-contain powdered, granulated or capsuled product, particularly in the pharmaceutical field.

Displays, merchandisers. In combination with paperboard, fabricated plastic packaging is frequently designed to be a counter display and dispenser as well as a package. A popular basic design includes paperboard display panels with half-round or triangular acetate bodies, allowing ample space for brand identification and product message.

Examining the operations involved in producing the simplest cylindrical package will serve to highlight the extent to which this type packaging requires special techniques.

Sheeting. Since the basic material is delivered to the plant in large rolls, it is necessary to cut the plastic for cylinder body and cover into requisite sizes for most economical layout in screen printing the design or copy. The sheeter does this cutting.

Printing. Reproduction of art and copy for the vast majority of packages is usually performed on plastic sheet by the screen process. The economics governing such printing demand the most modern type of automatic machines that print, dry and jog at high speed. Machines of this type are some 40 ft. in length. The new multicolor printing process mentioned earlier should be confined to large quantity runs.



ADAPTABILITY of fabricated sheet for the merchandising of many different type products is well illustrated by these cones, cylinders, rectangles. Special bases, lids and decorative effects provide individuality. (*Shaw-Randall photo*)

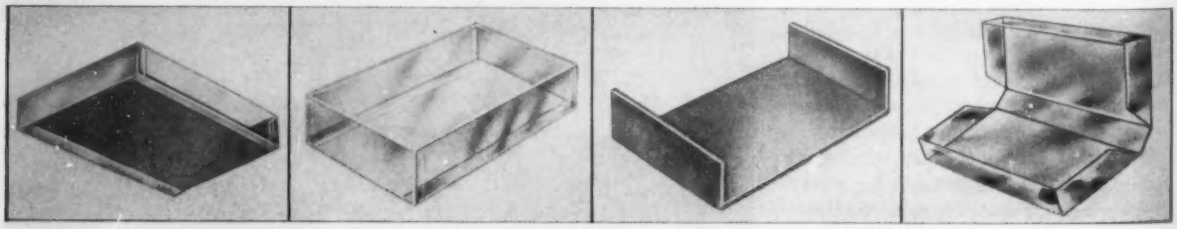
Cutting. The flat plastic sheets must be cut to the exact pattern required for forming the cylinder. It should be noted here that the cutting machines for plastic sheet are never used for cutting paperboard. Therefore, where board disks or inserts are used, a separate machine is needed.

Welding. The flat sheet from the cutter is rolled over a steel die to the required diameter plus overlap for sealing the joint. This sealing is performed by ultra-high-frequency machines that weld the closure electronically. Where chemical sealing is indicated, another setup is used.

Beading. Rigidity is achieved in the body of a cylinder by means of a beaded edge on both ends. This operation increases the strength of the container 10 to 15 times that of the basic plastic sheet. The sealed unit is inserted into the beader which forms the beads on both ends of the cylinder simultaneously.

Hot stamping. More often than not, the plastic cover for a cylinder package requires copy or design that cannot be screen printed at the same stage with the screening of the cylinder body. Hot stamping or embossing in gold or color is achieved by the use of various leafs and fine-etched brass dies in air-operated stamping or embossing presses.

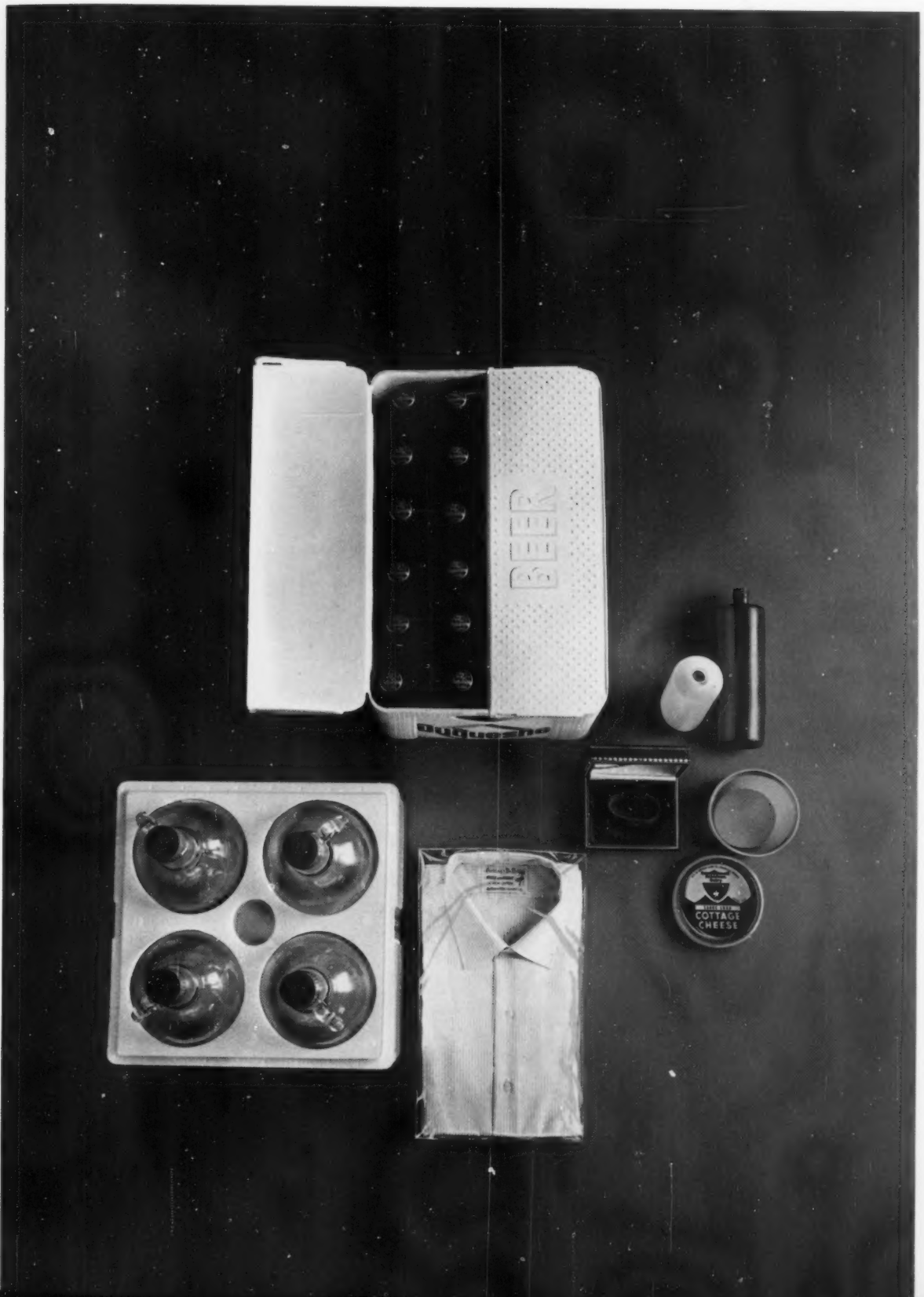
Drawn covers. Plastic covers for packages are made on pneumatically operated and electronically heated drawing presses that use male and female dies of precision-tooled steel. Cost of such dies ranges from $400 to $2,500 each and they are the proprietary items of the fabricator. A well-equipped packaging plant will have a full range of dies in several shapes to accommodate the packager's needs without involving him in die costs.



CONSTRUCTIONS. First three drawings show components of a self-locking box with plastic lid and paperboard base. Lid has bottom slides folded to seal package. Fourth drawing shows a one-piece, self-cover box designed for lightweight merchandise *(J-E Plastics drawing)*

KOPPERS

Koppers Plastics revolutionize packaging



Packages made from Koppers complete

SUPER DYLAN®

high-density polyethylene is a strong, lightweight plastic used for unbreakable containers in many industries. SUPER DYLAN can be injection or blow-molded at low cost. This tough plastic has a smooth, glossy finish. It's durable, lightweight, rust-proof, and chemical resistant.

The Duquesne Brewing Company now uses SUPER DYLAN for beer cases*. The new round-trip cases can make delivery after delivery without chips, cracks, or dents. On each trip through the brewery, the cases can be easily steam-cleaned to keep them attractive and sanitary.

Many aerosol manufacturers are using SUPER DYLAN for actuators and caps. These tough plastic "push-buttons" cost less than metal, are easier to assemble and never corrode.

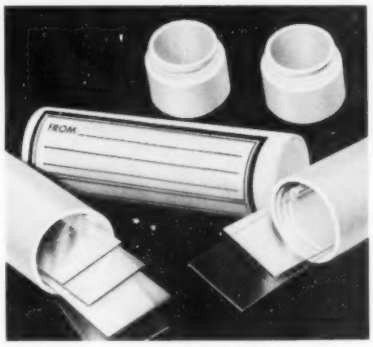
SUPER DYLAN film is one of the clearest high-density polyethylene films available. It can be boiled or frozen, heat-sealed, and has a built-in tear tape feature. More important, you can save $170.00 for every 1000 pounds of clear, crisp wrapping you may now be using.

SUPER DYLAN film runs commercially on high-speed machinery such as: Hudson-Sharp Campbell Wrapper, Roto-Wrap, Hayssen Automatic and Compak, Battle Creek 475, and Package Machinery FA 2, BW 7 and Transwrap.

**Patent applied for by Duquesne Brewing Company, Pittsburgh, Pennsylvania*







Packages made from DYLENE®

DYLENE®

When you open a compact, watch case, or rigid food container, there's a good chance you're handling DYLENE® polystyrene, a Koppers plastic that is ideal for packages that need dimensional stability, protection, and good looks. DYLENE is colorful, strong and impact-resistant. It's right for packages that must open and snap shut without chipping or cracking around the hinge. Versatile DYLENE molds easily in a variety of surface textures, colors and shapes. It makes an effective package in a wide temperature range —it's used for ice cream containers, and radio and TV cabinets. Packagers can choose from 15 formulations of DYLENE—each makes a better-looking package at less cost.

line of polyethylenes are versatile—and strong





DYLAN® both low and medium-density, is low-cost, moisture-proof and tough. DYLAN has remarkable chemical inertness, low specific gravity and freedom from taste, odor and toxicity.

Film made from DYLAN 2037 gives the best combination of properties available in *any* low-density packaging film. In one versatile material, you get excellent transparency, unusual high gloss, and good strength. DYLAN film gives excellent low-cost protection to candy, produce, paper products, virtually any product that needs bagging or wrapping. DYLAN film seals easily, prints clearly, and flows freely through bag-making equipment.

DYLAN is also a popular plastic for caps and closures. An excellent example is the unique new snip-off cap used by Lever Bros. on their Lux Liquid containers. Housewives just scissor the tip and get a measured flow of Lux with every squeeze of the bottle.

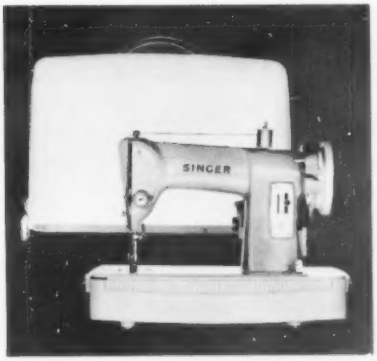
DYLAN is unaffected by most gases and it resists acids, alkalies, and common solvents. DYLAN is lightweight, corrosion-proof, flexible and tough even at low temperatures.

There is a DYLAN formulation just right for your application, whether it be film, squeeze bottles, closures or flexible containers.

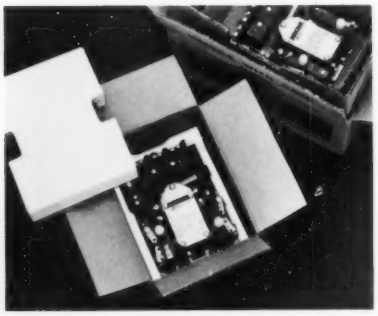
polystyrene are good-looking

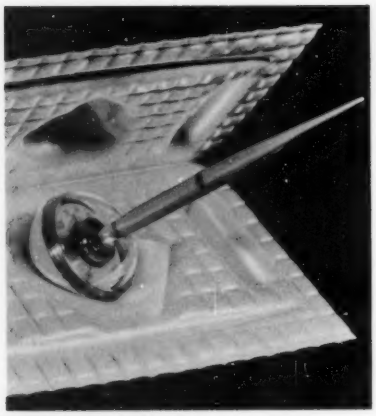






Packages made from DYLITE® expandable polystyrene are lightweight and shock-resistant









DYLITE® foam plastic—tiny beads that mold into any size or shape part — has already made great strides as a protective packaging material. With DYLITE, you can mold your package to fit any product. Your product travels safely, supported at every point, protected against jarring and abuse. Here at last is a low-cost packaging material that protects, ships and stores your product, a rigid material that is very lightweight, strong, shock-resistant, water-resistant, buoyant, and has excellent insulation value. Since it can be colored or finished in many attractive and marketable ways, it can also help to sell your product at the point of sale.

DYLITE is used to cushion typewriters, cameras, beverages, electronic parts and many other delicate products. Besides giving your product protection, DYLITE cuts packing and packaging costs. In relation to its volume and weight, DYLITE is very low-cost. Fewer parts are needed to package odd-shaped products, and it eliminates time in folding, creasing and filling.

Recently, this amazing foam plastic has moved far beyond the role of a protective packaging material. One of the latest innovations is a threaded DYLITE cosmetic jar that weighs one-tenth as much as a glass container, costs 20% less, and is unbreakable.

Another breakthrough for DYLITE is extruded sheet that can be fabricated into bags; laminated to paper, board, and other sheet plastics; and thermoformed into trays or platforms.

More and more manufacturers are switching to DYLITE packaging because it is lightweight, provides excellent cushioning, and is easy to mold into intricate shapes at a very low cost.

From Koppers complete line of plastics, you're sure to find just what you need—no matter what you're making, or how you're making it. For more information on any Koppers polyethylene or polystyrene for unlimited applications, write Koppers Company, Inc., Plastics Division, Pittsburgh 19, Pennsylvania.

KOPPERS PLASTICS

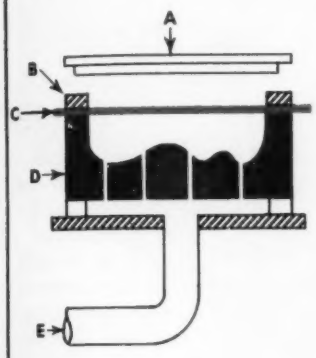
KOPPERS®

C-81-404

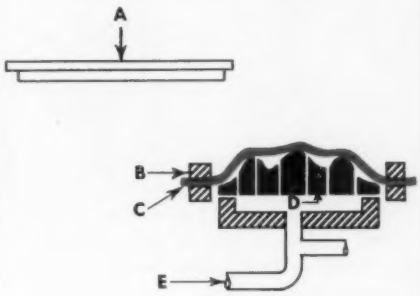
DRAWING COURTESY *Modern Plastics* MAGAZINE

Sheet Forming Techniques

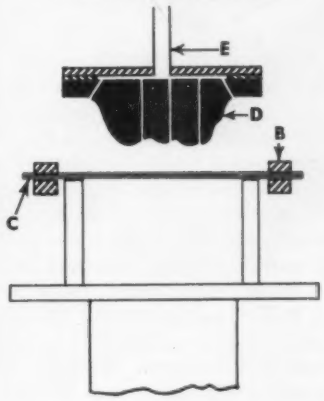
1. STRAIGHT VACUUM FORMING



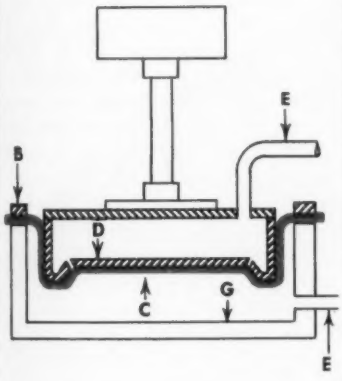
2. DRAPE VACUUM FORMING



3. FORCE ABOVE SHEET



4. VACUUM SNAP-BACK FORMING



A wide variety of sheet-forming techniques is available to satisfy many different types of job requirements. Most of these are variations of the following basic methods:

1. Straight Vacuum Forming—Clamped in stationary frame, heated sheet is vacuum drawn into mold.

2. Drape Vacuum Forming—Movable frame stretches sheet over male mold before vacuum is pulled.

3. Force Above Sheet—Mold descends onto heated sheet, partially forming it; vacuum is then pulled.

4. Vacuum Snap-Back Forming—Vacuum is pulled, drawing pre-heated sheet into cavity (G). Male plug moves down until it reaches a predetermined position. Vacuum is then applied in male plug.

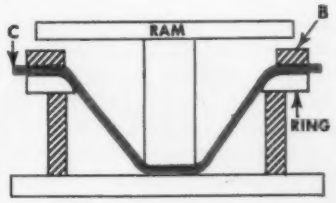
5. Plug and Ring Forming—Heated sheet is placed over a ring and clamped down. Mold mounted on ram is forced into it.

6. Forming into Female with Helper and Air Pressure—As press closes, cored plug pushes heated sheet into cavity. Air pressure is then introduced through cored plug, pushing sheet into female mold. Holes in mold let air escape.

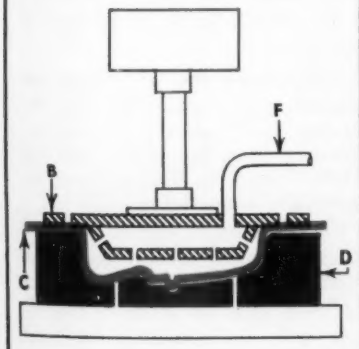
7. Pressure Forming—After heating, framed sheet is formed between matched male and female dies.

Legend: A—Heater; B—Clamp; C—Plastic Sheet; D—Mold; E—Vacuum Line; and F—Air-Pressure Line.

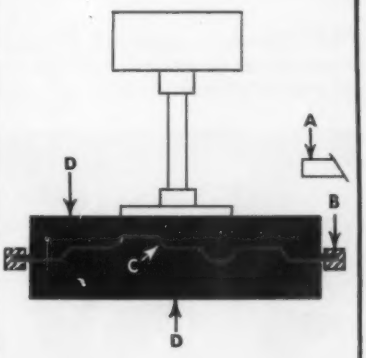
5. PLUG and RING FORMING



6. FORMING INTO FEMALE WITH HELPER AND AIR PRESSURE



7. PRESSURE FORMING



DRAWING COURTESY *Modern Plastics* MAGAZINE

Extruded vials and sleeves

by J. B. Grant*

The extruded plastic container is unique in that it offers the combined advantages of transparency or opacity, rigidity, durability and low unit cost. In recent years, it has contributed new force to the merchandising of hardware, jewelry, soft goods, drugs, food products, sporting goods, automotive and marine supplies, industrial supplies, cosmetics and many other products. In fact, any small item that can be sold either as a single unit, in sets or multiples is a likely candidate for successful packaging in these versatile plastic containers. Especially effective with consumer items, they can bring considerable merchandising glamour to a variety of products.

Materials that can be used to make these containers include virtually all the thermoplastics. Cellulose acetate butyrate leads in popularity at the present time because of its clarity, toughness and excellent workability in thin wall sections. Cellulose acetate, linear polyethylene, impact polystyrene and some forms of vinyl are popular too.

Constant cross-section constructions are produced in interesting shapes such as the rounds, rectangles, triangles, ovals and many special and irregular contours. But constant cross sections are no longer mandatory for the extruded container. Shapes, until recently restricted to molded products, have been developed and promise to open new horizons in design.

The most common wall thickness for all shapes and sizes of these containers is from 0.012 to 0.020 in., but wall thicknesses can range from 0.005 to 0.062 in. Inside diameters run from about $\frac{5}{16}$ to 3 in., with popular lengths from 2 to 7 in., although there is virtually no restriction in length. Container tubing that is rectangular, hexagonal, half round, etc., generally has a 3- to 5-in. periphery, although a range of from 2¼ to 9 in. is possible. Rectangular slides usually have a 2- to 9-in periphery with lengths ranging from 1 to 12 in. Scabbards usually are provided with a wall thickness of 0.008 to 0.012 in., an inside height of about $\frac{5}{32}$ in., an inside width of from 1 to 1¼ in., and lengths from 2 to 12 inches.

One way to close the end of these containers is to cement in a seal which can be vented, if desired, to provide air circulation. Venting is a desirable feature in a toothbrush container, for example, since it allows the brush to dry. This feature also can be used as a shaker for powdered materials, in which case an external fitting cap is added as a closure. Seals may be formed or molded and are available in a wide range of colors.

One or both ends of the tube may be fitted with a removable cap and may be swedged (curled in slightly at one end) for easy cap assembly. The tube end can be rolled in or out to a bead for more rigidity, and for snap-cap or push-plug applications.

Caps may be formed or molded and fitted to the inside or outside of the tube. Special shapes, perforations, pouring spouts, etc., are possible. Threaded caps may be supplied if the container is round. The threads are hot formed on the container. Vacuum-metalized caps have been enthusiastically received in many industries.

In combination with flocked vacuum-formed or molded trays and foil-laminated paperboard inserts, extruded sides in provocative shapes have found acceptance where high fashion and low cost were factors.

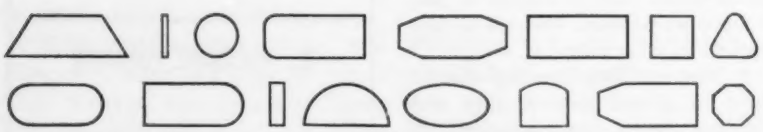
One- or two-color flexographic and three- or four-color offset printing are available. Hot stamping, too, is very effective, particularly with the new polyester gold or silver foils. Another popular decorating method is the use of heat-sealed or pressure-sensitive labels applied conventionally.

Definite cost advantages can be sighted. Containers with 1-in. inside diameters, 2½ in. long, complete with seals, caps and two-color label, costless than 1½ cents. And a toothbrush type container complete with seals, cap and printed label may sell for as little as 2 cents. In addition to low cost, semirigid containers often have re-use value, a real plus in merchandising multiple units of any type of product.

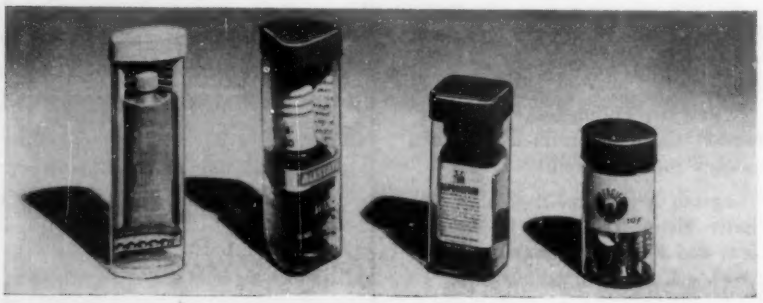
Tool charges for new shapes are relatively inexpensive and often rebatable. For product lines requiring the same cross section in different lengths there is no tooling charge for cutting the various lengths.

The dimensions of an extruded package must be closely controlled. Continuous control of size is the best guarantee that all closures and inserts will fit interchangeably and properly. Size changeability allows cap-fitting or insert flexibility to suit customer requirements.

* Works Manager, Extruded Plastics Inc., Norwalk, Conn.



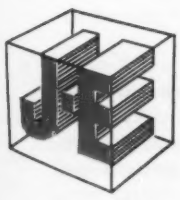
WIDE CHOICE in shapes and sizes plus variety in closures make extruded vials and sleeves effective containers for such diverse items as industrial parts, precision instruments and personal products. (*Drawing and photo from Extruded Plastics, Inc.*)





J·E — your first source for plastic packaging





Almost everything looks better — sells faster — in a sparkling plastic container. And J-E, the nation's largest designer-producer of semi-rigid plastic packaging, has two distinctive families of plastic containers, each backed by the know-how and the productive capacity which are your guarantee of prompt delivery of a quality product.

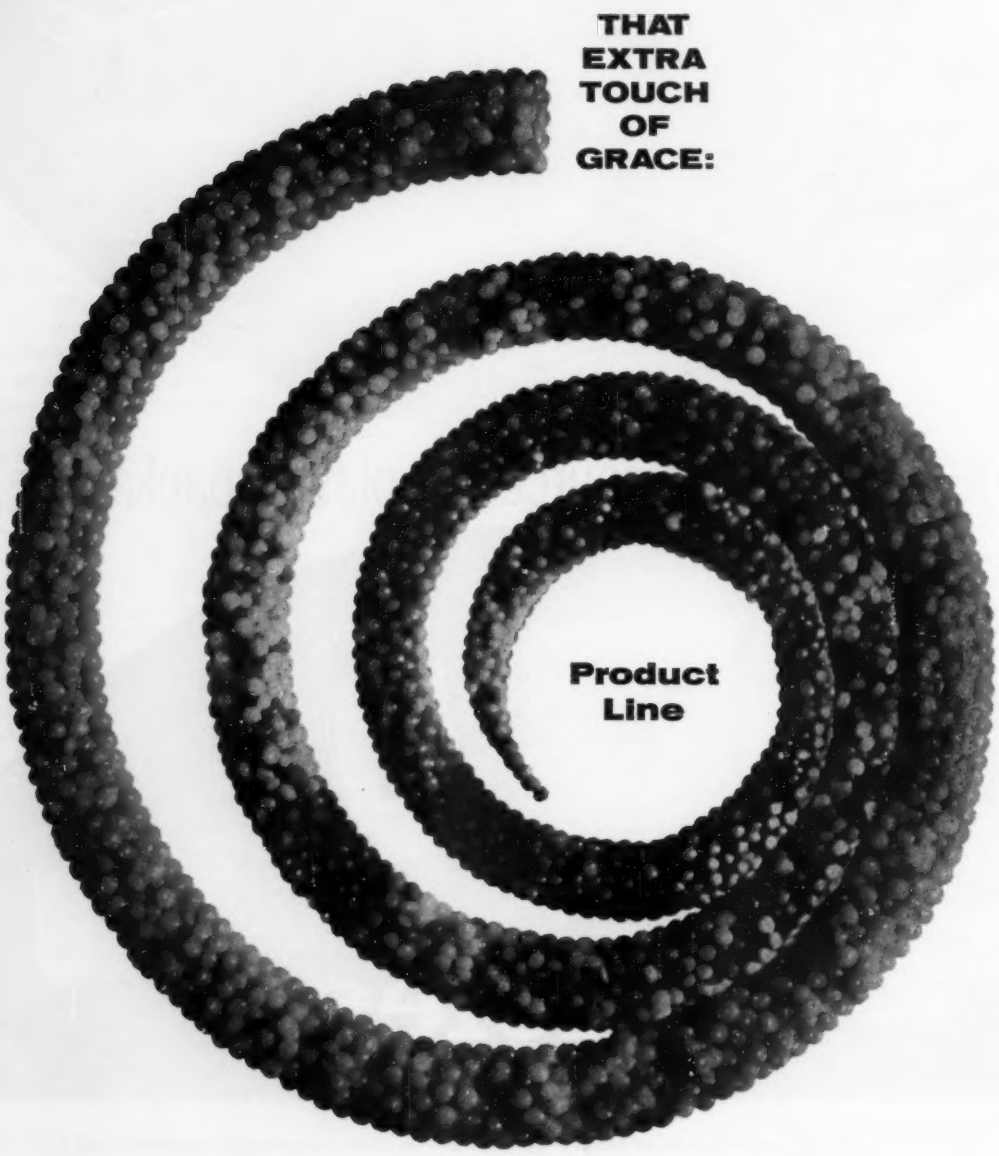
Choose any one of many shapes and sizes in pressure-formed FDA-approved styrene containers for fresh and frozen foods, available with snap-in, snap-on or snap-over lids, precision fitted to eliminate adhesives or tapes. Also available with heat seals.

Or choose a fabricated acetate container — the ideal showcase for soft goods, cosmetics, confectionery and paper products.

Best of all — why not write us? We will be glad to send specific technical data as it relates to your product. Or send us your product — our Design Center will return it in its own J-E design-engineered container.

J-E PLASTICS MANUFACTURING CORP. **400 Nepperhan Avenue, Yonkers, New York**

Phone: GR 6-3456



A full line of modern thermoplastics is one of the ten major services offered by the Grace Service Plan. You get expert assistance in selecting from a range of versatile materials: high density polyethylene, low and medium density polyethylene, polystyrenes, and special compounds such as flame retardant and electrical insulating materials. And now we offer you Moplen* polypropylenes to help you decide on just the right plastic to do the right job. It costs no more to call for that extra touch of Grace.



POLYETHYLENES

Grace offers a full range of high, medium and low density polyethylenes . . . general purpose resins and special resins and compounds. The most important applications of Grace polyethylenes are in the areas of injection molding, blow molding, and extrusion.

BLOW MOLDING: Blow molded bottles for liquid detergents, bleaches and other household chemicals, pharmaceutical containers, squeeze bottles.

INJECTION MOLDING: Housewares, toys, appliance and industrial parts; flame-retardant high density polyethylene for special applications; materials handling devices, such as tote boxes.

EXTRUSION: Wire covering and cable jacketing; pipe and tubing; film and sheet applications; monofilament grade resin uses.

And Grace offers other polyethylene grades and formulations . . . such as specialty resins for paper coatings and other coverings. You are sure to find what you need in the complete Grace polyethylene line.



POLYSTYRENES

Grace polystyrenes include general purpose resins, rubber modified compounds, and graft polymers. Some examples include general purpose crystal for easy and medium flow for thin-wall parts; heat resistant crystal for housewares; modified medium impact compounds for packaging applications; modified high and high-medium impact compounds for housewares, industrial goods. Also available are sheet extrusion grades for vacuum formed packaging, and high and extra high impact strength graft polymers for such applications as appliance parts, housings.



POLYPROPYLENES

Grace now offers Moplen* polypropylenes — newest polyolefin on the market. Grades and applications include injection molding resins for housewares, appliance housings, automotive parts; film grade resins for packaging and electrical insulation; electrical grade resins for wire and cable covering; extrusion grade resins for pipe and sheet; filament grade resins for consumer and industrial textiles, marine rope, and automobile seat covers.

Your Grace representative has all the technical details on the Grace product line. And don't forget to ask him how the Grace Service Plan can help augment your own organization in these other important service areas: market research, product design, mold design, market development, technical service, product and industry information, financial counseling, delivery and merchandising. Find out how to put that extra touch of Grace to work for you.

W. R. GRACE & CO. POLYMER CHEMICALS DIVISION, CLIFTON, N. J.

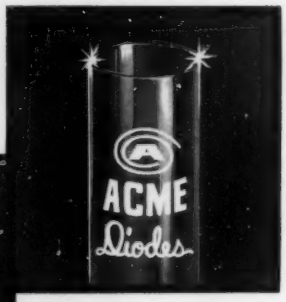
GREX® POLYETHYLENES · GRACE POLYSTYRENES · MOPLEN® POLYPROPYLENES · *MONTECATINI TRADEMARK

GRACE PLASTICS

LERMER Adds Important NEW Features

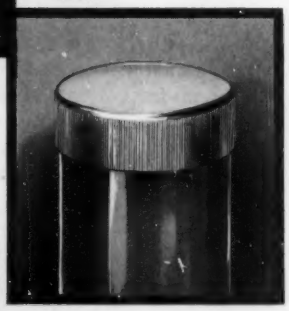
to *flexible acetate containers*

• Clear, flexible extruded containers • Full width straight opening • No turned-in top • Easy to fill and empty • Streamlined • Seamless • Can be printed up to 4 colors



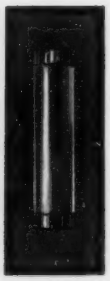


• Reinforced molded bottoms • Firm wide base—Prevents tipping over • Available in colors



• Molded polypropylene closures for uniform fit • Knurled for easy grip • Engineered to hold tight—Easy to remove and replace • Closures available in assorted colors • May be hot stamped in contrasting color with trade mark or other desired copy





• Containers available in diameters from ¼" through 1¼" • Any lengths up to 7" — Longer lengths on special order • Can be furnished in long lengths open at both ends. You can make your own containers by cutting to your sizes. We furnish closures.

Now is the time to consider the flexibility, the protection, the beauty, the features and economy of Lermer flexible plastic containers. Ideal for many products. **Write today for samples.**

LERMER RIGID PLASTIC CONTAINERS

OFFER UNIQUE PACKAGING ADVANTAGES FOR DRUGS, SUNDRIES, FOODS, INDUSTRIAL AND ELECTRONIC PARTS

For the utmost in ease of packaging, visibility, safety & protection, nothing compares with the desirable features of Lermer RIGID plastic containers.



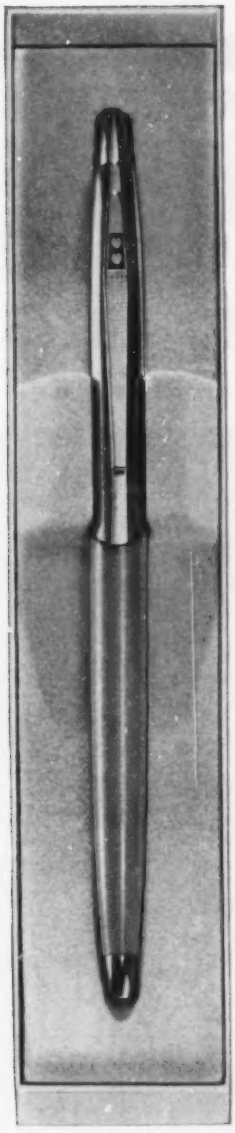
• Printed or decorated up to 4 colors on crystal clear, transparent or opaque colors • Largest line of RIGID plastic containers • 1/5 the weight of glass — greatly reducing ever-increasing shipping and handling costs • Lightweight and shatterproof — with rigid wall protection • Economical — with customer re-use value • Also made of new high density polyethylene — Poly-Opal*. Are chemically inert, stain resistant and have lower permeability to moisture and gases than conventional polyethylene. Write for full-color catalog, samples and prices. *T.M.

LERMER PLASTICS, INC.

502 South Avenue, Garwood, New Jersey

PIONEERS AND SPECIALISTS IN PLASTIC CONTAINERS SINCE 1919





Nashua's Stylour* Flocked Plastic gives Paper Mate a low-cost way to get "plush-look" packaging

Nashua's Stylour flocked plastic puts luxury-look packaging within reach of 'most any budget! And it is as versatile as it is economical.

This high-impact, low-temperature polystyrene can be vacuum-formed, pressure-formed, die-cut, or otherwise adapted to meet countless packaging requirements. You can also use it in place of costly fabric linings.

Investigate this low cost way to give your product powerful new sales-appeal. (It's great for protective packaging, too!) Available in rolls or sheets, with cotton or rayon flock, and in a wide variety of gauges and colors.

Send for samples and full information. Write Nashua Corporation, Dept. MPE-91, 44 Franklin Street, Nashua, New Hampshire.

*Reg. U.S. Pat. Off. #665216

NASHUA Corporation

CONTOURED, TRANSPARENT, PLASTIC *DISPLAY PACKAGING*

Designed To Sell Your Product

BY **PLASTIC ARTISANS**

P.A. DOMEPAK®

DOMES SEALED TO FACE OF CARD

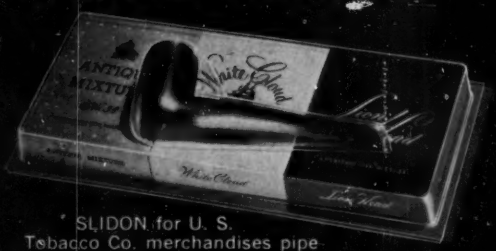
Dome flanges are sealed directly to prepared surface of card.



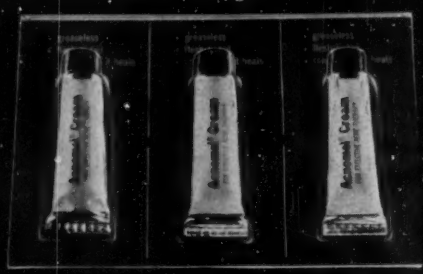
Gem export package for American Safety Razor Co. uses P. A. DOMEPAK

P.A. SLIDON®

Track-Edged Domes Or Trays With Single Or Multiple Product-Fitting Cavities



SLIDON for U. S. Tobacco Co. merchandises pipe and three tobacco packages.



3-Pocket **separable** SLIDON is a convenient sampler for Smith Kline & French Laboratories' Acnomel Cream.

DOMES SEALED IN DOUBLE PLY CARDS

Dome flanges are trapped firmly in position between plys.



TOPPS Watchband package for Manco Watch Strap Co., Inc. uses this double ply DOMEPAK

DUAL DOMES SEALED IN DOUBLE PLY CARDS

Permits product to protrude from both sides of card for double display exposure.



Flange to flange DOMEPAKs house pencil sharpener made by Sterling Plastics.

A Broad Range Of

CONTOURED SLIDE COVER BOXES

For Visible Sales Appeal Plus Re-use Value



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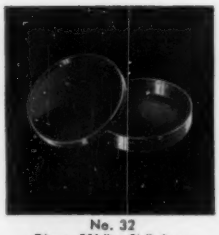
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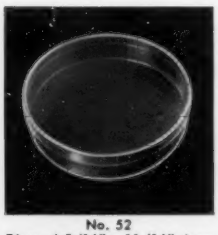
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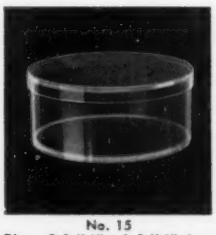
RIGID PLASTIC BOXES



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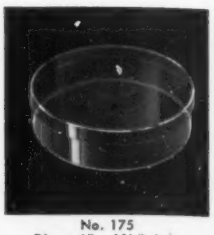
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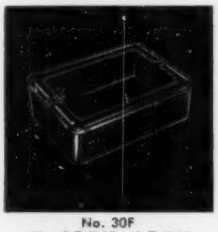
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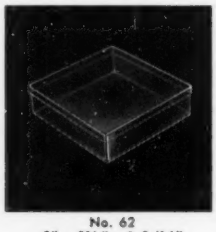
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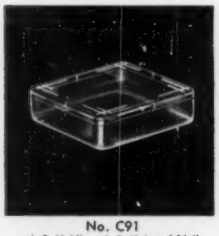
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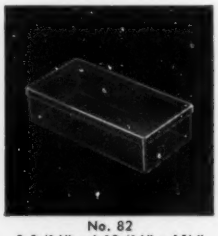
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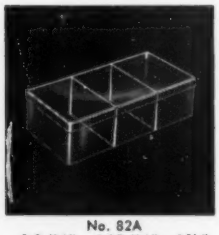
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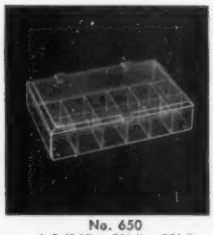
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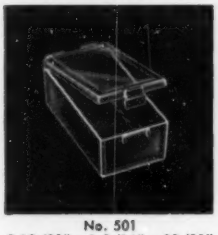
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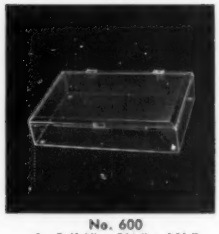
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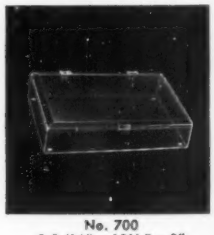
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No. 14
3 9/16" x 4 15/16" x 1¼"



No. 600
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No. 700
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Advertisers' Index by Subject Matter

METAL CONTAINERS

Listings do not necessarily cover entire lines of advertisers or all producers in each category. See also the listing in the Buyers' Directory under the category for which information is sought, especially listings marked with bullets. Also consult Advertisers' Index, last pages of the Encyclopedia.

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SECTION 9

METAL CONTAINERS

How to select and use metal cans

by Robert C. Stolk*

During the 150 years since Peter Durand patented the construction of a new type of metal container, the use of metal cans has grown to a point where their annual value exceeds that of any other type of container.

Metal cans contribute to the successful packaging of some 2,500 different products. The reasons for the can's effective role are basic:

1. Metal cans are strong and provide exceptional protection
2. They are economical
3. They lend themselves to high-speed filling
4. They are an efficient merchandising medium, especially for self-service
5. They are convenient for the consumer to use and discard.

Great strides have been made in recent years in the methods and materials used for making cans and in the filling speeds that can be achieved on the packing lines. Convenience features such as nondrip pour spouts, easy opening and firm reclosure devices are helping cans do an even better job than they've done in the past; new shapes, dimensions and plastic fittings together with new design concepts and improved lithography make the sometimes taken-for-granted stereotype a formidable merchandiser. And its suitability for multipacks is another increasingly important merchandising advantage.

There have been more new, formulated products for the floor, kitchen and the car put into cans in the past five years or so than in the previous 20 years. These are specialized products such as floor waxes, liquid detergents, car polishes and so forth. Containers and linings had to be developed to meet every specification and, at the same time, the containers remained economical and were designed to be attractive and easy to use.

No other container challenges metal cans in annual dollar volume. As a matter of fact, of all forms of containers and packages, large or small, of any material, none now exceeds the $2.0 billion can industry. Can output was estimated at 43.8 billion units in 1960, a record year.

Approximately four million tons of metal, mostly steel, go into the manufacture of cans each year and only 4/10 of 1% is tin. In recent years, it has become possible to produce cans with enamel linings that do not require tin at all.

The compositions of the steels used in cans are determined by the need for strength and corrosion resistance. Tin coatings further protect the steel from both external and internal corrosion, but it is not possible to overcome the effects of unsuitable steels by any reasonable increase in tin coatings. To maintain economy in can production, a few basic steel types are generally used for a large variety of can applications.

Tin coatings may vary from 15 millionths of an inch to 80 millionths of an inch in thickness on each side of the plate surface and are most usually applied by the electrolytic tinning process. Products such as motor oil, antifreeze, coffee and some detergents, however, can be packaged without any tin coating at all. When tinplate is not used, enamel coatings are almost always necessary both inside and out to prevent corrosion.

Aluminum is another metal coming into prominence for can making. Seven motor oil packers are using aluminum. Also, aluminum cans are being used for citrus concentrate, beer, and fish and meat products. Aluminum ends are used for steel- or fibre-bodied cans for several items. Intensive, collaborative research between aluminum producers and can makers is solving technical problems to the end of permitting a greater range of product application for aluminum. (See also article on aluminum cans in this section.)

Can linings

A multitude of organic coatings or linings, designated "can enamels," prevents interaction between steel or tinplate and sensitive or aggressive products. These are baking varnishes made from natural or synthetic resins and drying oils.

Until the Pacific sea lanes were cut off in 1941, most can enamels were essentially baking varnishes prepared from Chinawood oil and natural resins. During the early years of the war, chemists began to formulate satisfactory interior and exterior coatings from domestic drying oils and synthetic resins. Many of these coatings have been further improved and now provide far better performance than the prewar enamels. As a matter of fact, improvements in materials and methods of applying the coatings mean much better lining performance.

The use of synthetics also allows more "tailoring" of enamels—to meet the requirements of specific products—than was possible previously. It is estimated that during the past five years there has been more tailor-making of cans than in any earlier

*Vice President in charge of Sales, Canco Div., American Can Co., New York City.

period. This does not mean, however, that can costs are skyrocketing. Often, minor adjustments of standard formulations are all that are necessary.

Can linings are used to preserve certain product characteristics, prevent corrosion of the interior or exterior of the container, permit the use of more lightly coated and, consequently, less-expensive grades of tinplate—or, as noted, to replace tin. The first can enamels were used for red fruits such as cherries and raspberries to prevent bleaching effect of the plain metal on product color.

Products such as rhubarb, tomato-juice cocktail and some fish products are noted for their detinning action on tinplate and, therefore, are packaged in enamel-lined cans.

Other enamel applications include:

Phenolics, resistant to animal fats, are used for meat and fish products and industrially for cosmetics, cleaners, dentifrices, medicinals and paints.

Vinyls are valuable for cold-processed products sensitive to metals and off-flavor development.

Epoxy resins are used for corrosive products such as some detergents and water-base latex paints.

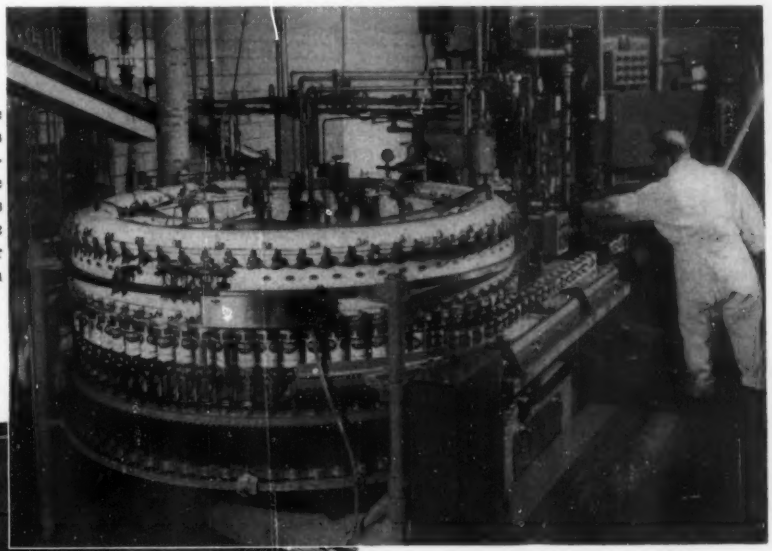
For convenience rather than for corrosion prevention, coatings classified as "release agents"—a phenolic coating modified with fatty acid amides—are being used for dog food and meats to prevent the sticking of the contents to the container.

Can constructions

Side seams. Can blanks are notched and edged so that opposite sides will lock together when blank is formed into a cylinder over bodymaker horn. Flux for soldering is applied and side seam is hammered or "bumped" tight. The side seam is soldered to make sure that it is absolutely tight and has the strength to withstand the pressure of processing. For some products such as motor oil, citrus concentrates and detergents, special cement is used in the side seam instead of solder. Cans for powders and certain dry products, however, may not require any bonding agent in the side seam.

Cemented side seams do not require tinplate (as in the case with soldered side seams) and they permit all-around lithography. Soldered or welded seams show an area of bright metal where heat of application would damage the lithographed coating. The cemented side seam is particularly important from a merchandising standpoint. Uninterrupted lithography permits more flexibility in label design.

The vast majority of cans is made from a flat blank with one of the side seam closures described previously. And these cans have separate metal tops and bottoms that are curled to fit the flanged can body. A sealing compound is applied and a double seamer attaches the bottom end to the can body at the can maker's plant; the tops, of course, are shipped to the packer to be applied after the cans are filled.





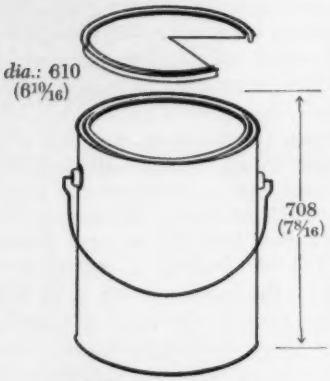
THOUSAND-A-MINUTE can line at Genesee Brewing Co. emphasizes two of the reasons cans are a major force in packaging—speed and automation. Below, metal cans are arriving to be mechanically depalletized. Each pallet contains 1,800 cans. From here the containers go to the canning process (right), where the spout filler and closing machine turn out cans at ultra-high speeds. (*American Can photos*)

However, there are also stamped and drawn cans that are seamless. The most common are the sardine cans, both oval and rectangular. Also included are the shallow, special-purpose cans for shoe wax, pressure-sensitive tape, photographic film, pills, ointments and so forth. A number of different types of closures are employed, including slip-cover tops,

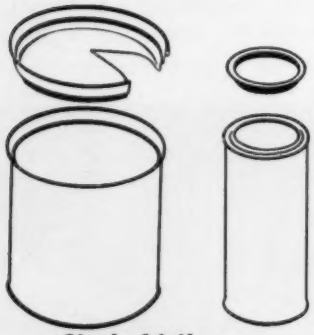
(*Continued on pages 330 and 333*)

Typical can sizes, uses and special features

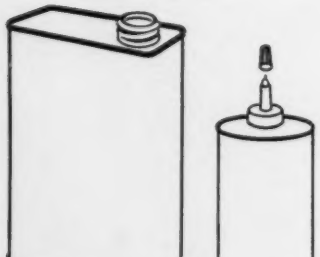
Can dimensions: 610x708 means that the can is 6 19/16 in. in diameter and 7 7/16 in. high. In the case of rectangular cans the first two sets of digits refer to base dimensions; the third set to can height.



Multiple-friction



Single-friction



Oblong I-style **Oval**

Style	Common size range: Dimensions	Common size range: Capacity	Some uses	Special convenience features
Round, multiple-friction cans	208x203 to 610x708	1/32 to 1 gal.	Paint and related products	Large opening, firm reclosure ears and bails for easy carrying for large sizes
Round, single-friction cans	213x214 to 610x708	1 to 10 lbs.	Paste wax; powders; grease	Good reclosure
Oblong I-style cans	214x107x413 to 610x402x907	1/16 to 1 gal.	Varnish; waxes; insecticides	Pour spout and screw cap closure
Detergent cans; general-purpose round cans with nozzle	211x508 to 307x712	12 to 32 oz.	Detergents; floor wax; outboard motor oil	No-drip pour spouts of plastic for detergents, metals for some other uses
Aerosol cans	202x214 to 211x604	3 to 16 oz.	Foods; non-foods	Designed for fit of standard valve cap
Flat-top cylinders	401x509 to 610x908	1 to 5 qts.	Oil; antifreeze	Unit of use capacities; tamperproof since it can't be reclosed
	211x413 or 604	12 and 16 oz.	Beer, soft drinks	
	300x709	24	Beer	
	307x712	32	Beer	
	211x300		Cat food	
	300x407		Dog food	
Crown cap, cone top can	202x314 to 312x600	6 to 32 oz.	Beer, soft drinks; chemicals	Tamperproof closure; easy pouring
Key-opening, reclosure cans	401x300 to 502x612	½ to 2 lbs.	Coffee	Good reclosure
	401x307.5 to 603x712.5	1 to 6 lbs.	Shortening	Lid is hinged
Key-opening, nonreclosure cans	Wide range of sizes and shapes		Sardines; large hams; poultry; processed meats	Contents can be removed without marring product
Oval and oblong, with long spout	203x014x112 to 203x014x503	1 to 4 oz.	Household oil; lighter fluid	Small opening for easy flow control
Hinged-lid, pocket-type can	Wide range of sizes		Tobacco; strip bandages	Firm reclosure
Flat, round cans	213x013	1⅛ oz.	Shoe polish	Friction closure
Flat, hinged-lid tins	112x104.5x004 to 212x205x003.75	12 to 30 tablets	Aspirin	Easy reclosure
Square, oval and round-breasted containers	Wide assortment of shapes and sizes		Powders	Perforations for dispensing; reclosure feature
Slip-cover cans	Wide range of sizes—straight side and flaring		Lard; frozen fruit; eggs	Simple reclosure

DRAWINGS COURTESY CAN MFRS. INSTITUTE



Flat round **Hinged-lid**



Key-opening





Square-breasted



Detergent can

ALCOA is the registered trademark of Aluminum Company of America



before you can say Ekco-Alcoa...

rigid foil containers are on their way

No other single source offers such a wide selection of useful, distinctive aluminum packages—or delivers with such speed.

Round, square, oblong, heart-shaped . . . for coffee cake, tomato soup, ball bearings . . . in natural finish, unusual patterns, or rich, brilliant colors . . Ekco-Alcoa makes over 200 standard foil containers available instantly through its nationwide network of distributors.

All kinds of specialty containers and closure materials are also available. And Ekco-Alcoa even offers a wide assortment of high-speed packaging equipment on either a sale or rental basis.

It costs no more to take advantage of Ekco-Alcoa's complete line. Ask your nearby distributor for details. Or write direct.

EKCO-ALCOA CONTAINERS INC.

GENERAL OFFICES · WHEELING · ILLINOIS

The Plus Container

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SMALL & MEDIUM-SIZED METAL CANS



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FOOTNOTE: *Miniature cans for sampling — a hundred thousand or millions. Ask us.*

BURDICK & SON

INCORPORATED • ALBANY, N.Y.



STRIKING PATTERN of orange and white on these newly designed containers gives an impression of continuity by utilizing the mass units of color. Display problems presented by most 6-oz. shelf-pack cans are minimized. (*Cans designed by Continental Can*)



CONVENIENCE PLUS ATTRACTIVENESS. Combination metal cans with plastic closures. Seasoning can (left) features hinged plastic closure; apothecary can has ribbed polyethylene cap; talc can (center) features revolving plastic sifter cap; spice container (right) is fitted with pour, sift rotary dispensing polyethylene disk. (*J. L. Clark photo*)

(*Text continued from page 329*)
screw tops and hinged or slide lids.

At one time, cans were divided trade-wise into two groups: *sanitary* and *general-line* cans. The sanitary can, or packer's can as it was sometimes called, was developed for the canning of hot-processed foods. It was cylindrical because this shape is easiest to make, uses the least amount of material and is the best design for holding pressure. Also it is easy to handle, fill and label. General-line cans included all containers not produced for hot-processed foods.

In recent years, the terms *sanitary* and *general line* have been losing their distinction. However, product distinctions are still very much in effect and cans for foods, especially hot-processed foods, represent one class of container while cans for nonfoods are a class in themselves. The styles and sizes of most food cans have become quite standard over the years. However, cans for some foods, such as meats, have departed from the earlier cylindrical shape and are key-opening squares, rectangles and the like.

The nonfoods are produced in a very wide range of types and sizes to meet the much wider range of products. Cylindrical, oval, oblong, square and flat shapes are available in some 500 different styles and meet varying requirements for products ranging from pills and baby powder to lighter fluid and paints. Some nonfood cans are the same style and appearance as the cans used by canners. Others are rectangular with nozzled screw closures. Still others are key-opening squares or cylinders. A modification that has been widely adopted is the self-tracking beaded rip strip for key-opening cans which prevents the narrow strip of metal from climbing up and down the key as the can is opened.



NEW powder aerosol in 6-oz. size is made for the spray dispensing of scented talc. Container is of metal and is adapted with a nonclogging powder valve and an actuator. (*V. C. A. photo; Crown can*)

Some cans have special, tight reclosure features such as the paint cans with their multiple-friction metal tops. These cans are designed for the packaging of polyvinyl-acetate and latex base paints.

Paint cans in the one-gallon size and larger are provided with ears and bails for easy carrying. A development in this connection is the clinched ear which has maximum strength and eliminates soldering, making a neater container.

The illustrated table on the opposite page lists a number of common styles, sizes and uses for general-line cans.

Modified constructions

Metal cans with transparent plastic window tops are among the relatively new developments for the canning of nonprocessed foods. The primary use thus far has been for specialty seafoods such as oysters, crab meat and lobsters, where merchandising advantages of window-top cans are cited. Compared to the use of salmon, tuna

and sardine cans, the use of window cans is still small and generally restricted to packing operations on the two coasts. The fresh products packed must be kept refrigerated. Distribution is usually set up for fast movement of canned products to the consumer, because of the perishable nature of the products. The use of window-top cans for dry and frozen products is still in the research or experimental stage.

Cans with built-in stacking features are designed so that the bottom of one can fits securely over the top of the can below it to permit safer, higher stacking. This is especially helpful for point-of-sale stacking for display.

The use of functional beading of can bodies is becoming more prevalent for imparting strength. The architecture and arrangement of bead sequences on lithographed cans may ultimately be employed for aesthetic values as well.

Challenging products

To keep pace with the growing demand for containers and packages, can makers have consistently made it their business to be of service to the packer and to develop or modify metal containers so that they are best able to serve the needs of packers. Services may include the complete designing of a container for a new product or help in designing or selecting the best filling and other processing equipment for the packer's plant. A special service is often rendered in aiding the packer by suggesting modification of the product formula to reduce its corrosiveness, or to increase its stability or even its consumer acceptability. Often this permits the use of a more economical container specification.

The research of can makers is responsible also in large part for the sanitation and dependability of the canning process. And canners seldom have to look very far for a can manufacturing plant. Regardless of location, chances are that cans can be quickly and continuously supplied.

The benefits afforded the packager by the research activities of can manufacturers are evident from the following examples of products that challenged the ingenuity of can makers. Not only does successful research such as this give the packer of these products a wider selection of containers, but also it opens up new possibilities for other products.

Beer, which was first put into cans in 1935, is an outstanding success story. The lightness and convenience of cans, the fact they chill fast and are nonbreakable and the "no-return" feature have been major factors in consumer acceptance.

Growth in the use of cans for beer has been constant. In 1935, 160 million beer cans went to market; in 1949, more than 3.7 billion cans were used; by 1953, more than 6 billion; and, by 1960, 8.9 billion cans were manufactured. Today, beer cans are the can-making industry's largest single production item. Now 80.2% of all beer goes to market in containers and, of this, 40.1% is canned.

Before cans could hold beer, it was necessary to perfect special linings to protect sensitive flavor and special strength features to withstand the high internal pressure achieved during the processing of beer. The can construction that finally proved satisfactory had these features: a two-coat interior lacquer system with a third coating at the soldered side seam; can ends that would be strong enough to contain the product during processing and yet not so thick that they could not be opened readily at home with a can opener; and, special side seam techniques had to be developed to strengthen this area which, like the ends, is particularly vulnerable to stress during processing.

Soft drinks present many of the same type of problems as beer because both require lined containers and both these also must withstand relatively high pressures in processing or in commercial channels. In addition, the different flavors of carbonated beverages often require different linings.

Virtually all of the leading soft drink makers use cans to some extent. Soft drinks have become a significant and rapidly growing market for metal containers.

The convenience of aerosol packaging has caught consumer interest to the extent that approximately 675 million pressure cans were used in 1960 for a multiplicity of products. Most prominent of these were shaving cream, toothpaste, hair spray, room deodorants, insecticides, polishes, paints, whipped cream, and dessert toppings. It is estimated that by 1965 the aerosol-can volume will reach the 1¾-billion mark—showing the results of heavy growth in further packaging of drug, cosmetic and food products. (See also articles on aerosols in Section 11.)

Filling speeds and economy

The metal can is capable of the highest filling and sealing speeds known to packaging. Can costs have been kept low by technical improvements, such as the increased speed of present-day can-making and -closing equipment and improved can-handling methods. Present can costs are indicated by the prices for varied can types. For example, a number two tomato can costs approximately four cents; a one-pint oblong reclosure can, approximately seven cents; a one-pound key-opening coffee can approximately eight cents; and a one-gallon paint can with bail, approximately eighteen cents.

Normal ranges of filling speeds for common products are: canned baby foods—150 to 550 cans per minute; canned food (corn, tomatoes, peas, etc.)—100 to 450 cans per minute; canned beer—250 to 950 cans per minute; and canned motor oil—120 to 600 cans per minute.

Some food products, such as applesauce, have liquid characteristics which permit faster filling. Commercial filling speeds up to 525 cpm have been achieved with applesauce. Frozen orange concentrate, as another example, can be canned at speeds up to 850 cpm. The smaller size of the cans is an added factor in this product category. The speed champion of them all, however, is beer. Filling speeds of up to 1,000 cans per minute in this category have been achieved experimentally.

Design

More attention to the creation of compelling design for cans has been in evidence in the last five or six years than in any period previously. The vivid labels achieved with lithography make maximum use of the cylindrical shape of metal containers. The brilliant colors, virtually marproof, are able to stand up in water, heat and cold.

Lithographed labels used for products such as detergents, polishes, waxes and allied household items, frozen fruit juices, beer and aerosols are powerful salesmen on the supermarkets' shelves.

Hot-process foods probably will continue to depend on paper labels because of the need for versatility of labeling at the packer's plant.

Collapsible metal tubes

by John E. Smith*

A unique place in packaging is held by collapsible metal tubes. They offer complete product protection, keep contents fresh and pure until entirely used, and deliver products in the exact quantity desired. They are light, compact, strong and attractive.

Tubes excel in user advantages: built-in applicators, such as the nasal tip, the mastitis tip, and the eye tip; labels that present an attractive appearance, yet may be easily peeled off by the druggist if necessary; closed-end tubes assuring an infallible air-tight seal but one which can be punctured easily just prior to use. Caulking and grease tubes, especially important for do-it-yourself products, have special elongated necks. These are sometimes bevelled for easier application of the product.

Materials

The packager contemplating the use of collapsible metal tubes must first consider materials available and product compatibility. There are three basic tube materials: aluminum, lead and tin.

Aluminum is the most commonly used material in tube manufacture. It is very light, strong and good looking. Toothpaste, grease, glue, liquid solder and even peanut butter are packed in aluminum tubes. Some pharmaceuticals also use aluminum, but generally these require an internal lining.

Lead is less expensive than either tin or aluminum. Economy is its chief advantage. Lead is used to package lighter fluid, glue, grease, and the like. When internally lined, the lead tube is satisfactory for packaging cosmetics, toothpaste, pharmaceuticals, and a variety of other products.

Tin is the most expensive material for tubes and, because of cost, is generally used on smaller tubes or where strict demands of compatibility must be met—especially for products such as ophthalmic and other medicinal ointments.

To overcome special problems, tin-coated lead and tin-lead alloy tubes sometimes are used. The idea of tin coating was instituted during World War II, when tin was in short supply. It has been retained to some extent in order to take advantage of the lower cost as compared with the use of pure tin.

Manufacture

Tube manufacture consists basically of blank fabrication, impact extrusion of the tube, trimming, coating, printing, capping and packing. Additional steps may include internal coating, westiting, shoulder spraying and other special operations.

Blank fabrication. Metal of the desired alloy is melted into slab form and rolled to the proper thickness. A blanking press then blanks the resulting elongated plate into circular slugs of the desired diameter. The diameter of the slug determines the diameter of the tube. Thickness controls the tube's length.

Impact extrusion. After the slug is blanked, it is fed into the die of either a vertical or horizontal extrusion press. The slug is struck by a mandrel and, under tremendous pressure, is momentarily reduced to a molten state and forced to flow up the mandrel, forming a tube.

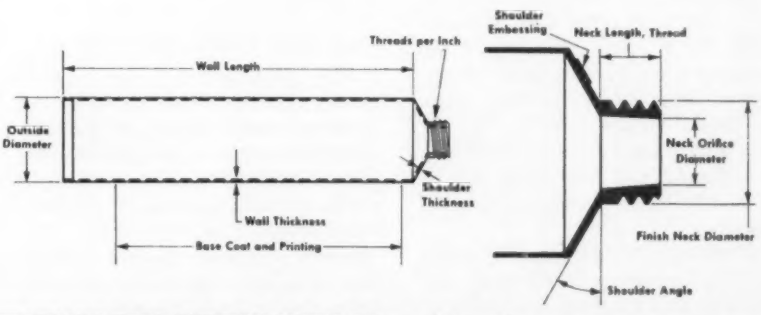
Trimming. After stripping off the press mandrel, the tube is sent to the trimmer. This machine is equipped with two knives and a circular thread roll. The tube is placed on a horizontal mandrel. One knife cuts the open end to the desired length, the other trims the neck. The circular thread roll forms threads in the tube neck. If the tube being manufactured is aluminum, it is annealed to soften the metal. (In the case of pharmaceuticals or some other products, the tube may be washed before annealing.) If the tube is lead or tin, no annealing is necessary; tube goes directly to coater.

The coating operation is perhaps the simplest and least troublesome in the manufacturing procedure. The tube is again put on a horizontal mandrel and brought into contact with a coater roll. The roll revolves continuously, feeding coating ink from a pan. When the tube comes into contact with the coater roll, it also revolves and is coated.

Printing. After coating, the tube is oven dried at temperatures ranging up to 360 deg. F. It is then ready for printing. Tubes may be printed in as many as four colors. This operation is the most intricate and troublesome in tube manufacture.

Tube offset printing is accomplished by transferring coating from a fountain through a series of rolls to a plate. This plate is wrapped two-thirds of the way around a small cylinder. The plate then transfers its impression to a rubber blanket on a large revolving cylinder.

On the other side of the machine, the coated tube is placed on a mandrel. The large cylinder revolves, the tube comes into contact with the impression on the rubber blanket and makes a revolution, and is printed. A separate plate-rolls-fountain set-up is



STANDARD TUBE NOMENCLATURE. When ordering tubes, give information on the product to be packaged and tube specifications including type of metal to be used, diameter, length, needed neck size and type of opening, cap style and color, decoration, internal lining if one is required. (*A. H. Wirz drawing*)

*Production Manager, A. H. Wirz, Inc., Chester, Pa.

Table I—Standard sizes and tolerances of collapsible tubes

Tube size	Tolerance over and under normal diameter for decorated tubes	Maximum length for any given diameter tube	Shoulder thickness		Wall thicknesses				
					Tin		Lead		Alum.
			Max.	Min.	Max.	Min.	Max.	Min.	Max.
⅝	+.002 −.003	2	.014	.006	.0033	.0027			
½	+.007 −.003	4	.021	.009	.0033	.0027	.0050	.0040	
⅝	+.007 −.003	4	.030	.011	.0038	.0032	.0055	.0045	.0048
¾	+.007 −.003	4½	.030	.011	.0039	.0031	.0056	.0044	.0048
⅞	+.007 −.003	5½	.030	.012	.0044	.0036	.0061	.0049	.0050
1	+.007 −.003	6	.030	.013	.0046	.0038	.0063	.0051	.0050
1⅛	+.007 −.003	6½	.035	.015	.0050	.0040	.0067	.0053	.0055
1¼	+.007 −.003	7	.035	.015	.0055	.0045	.0072	.0058	.0055
1⅜	+.007 −.003	7½	.035	.015	.0055	.0045	.0072	.0058	.0060
1½	+.007 −.003	7¾	.035	.015	.0060	.0050	.0077	.0063	.0060
1¾	+.007 −.003	8	.035	.015			.0090	.0072	.0066
2	+.007 −.003	10	.035	.015			.0105	.0085	.0077

needed for each color, but all colors are applied simultaneously.

Capping and packing. The tube is now sent through another oven similar to the coater oven to dry the inks. When dry, the final operation of capping, either by hand or by machine, is then performed. Packing is in partitioned boxes. The open ends of the tubes are up.

Miscellaneous operations. If a product is not compatible with a certain metal, or if price advantage is obtained by using a less expensive metal, *internal lining* may be specified. There are several linings available, but the most widely used are wax, vinyl coat and phenolic coat. The lining may be applied by either flushing or spraying processes.

Westiting is the term applied to the spraying or dipping of the crimp end of a tube with a cement or a vinyl lacquer. This is sometimes necessary for a product which requires an extremely tight seal. For the majority of uses it is unnecessary; for a lighter fluid, for example, it is desirable.

Some users require *shoulder spraying* with either a clear or pigmented coat. This is done primarily for aesthetic reasons, and also, in the case of lead, to protect the shoulder from tarnishing. Aluminum tubes are sometimes manufactured with *brushed shoulders*. An attractive, satiny finish is the result.

Caps and applicators

The appearance of the tube is greatly affected by the cap. Color and geometry must conform to the tube decoration and size. The tube industry offers a wide variety of caps and applicators, for both appearance and functional design. (See Table II for orifice openings and their standard designation.) The Barry applicator, currently being used on liquid aluminum, liquid rubber and glue tubes, is a case in point. It is polyethylene and therefore requires no liner, provides a good seal, and has a flap with which to apply the product.

Three major plastics are used in tube cap manufacture: polyethylene resin, urea formaldehyde resin and phenolic resin. Polystyrene is used to some extent. Polypropylene is being evaluated for possible applications.

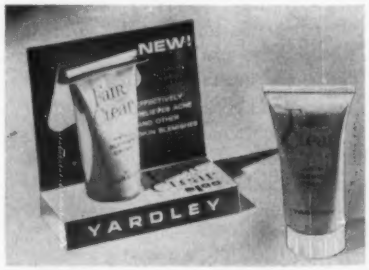
If a hard cap (urea or phenol) is used, a liner generally is also required to provide a good seal. There are liners to suit almost any test. Pulp or cork faced with coated paper are the most common. The same materials may be faced with tin foil, aluminum foil and other materials. (See also the article on closure liners and seals p. 369.)

Quality control and specifications

For many years the industry has been operating with standard tube specifications. (See Table I.) Tube length, thread height, wall thickness—all are the same dimensionally. The tube manufacturer takes great pride in his ability to hold these dimensions in ten-thousandths of an inch, and in controlling colors within limits the average eye would not notice. At first glance it might seem unnecessary to control quality this closely. The following, however, are some factual examples of why it is necessary to do this.

A pharmaceutical manufacturer uses a closed-end tin tube to package a special product in which an absolutely airtight seal must be guaranteed. The closed end should be easy to puncture, yet thick enough to guarantee no pin holes. The closed-end specifications are .006 to .011 inch in thickness. A quantity of tubes was shipped in which 5% were from .002 to .004 inch over specification. This lot was rejected because the extra few thousandths made puncturing difficult.

A packager of lighter fluid uses a



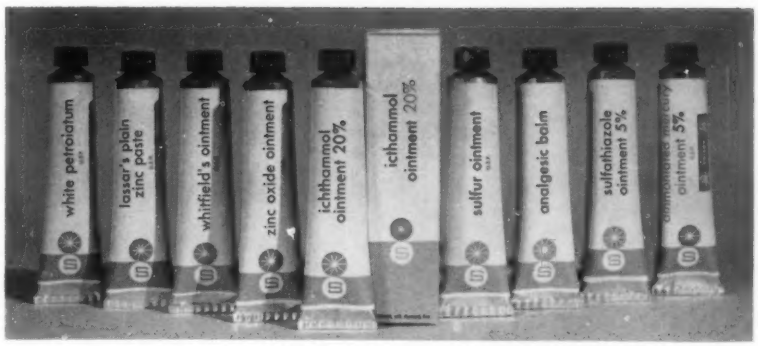
STAND-UP collapsible tube has over-size plastic cap. Internal coating is modified epoxy resin. Decoration is three-color lithography on white. (*Peerless Tube photo*)

lead tube. The walls on the order in question were run a thousandth too light on half the order, and resulted in ¼ of 1% with pin holes. If the product were a cream, paste or grease, this small percentage would have been acceptable—but this was not the case with lighter fluid. The thinner walls caused a rejection.

A manufacturer of eye make-up discovered that some caps, in a particular lot, were put on so tightly customers could not remove them. Investigation showed 5% of the order had slightly undersized neck lengths, allowing some of the product to leak on the cap threads. The material then hardened, "gluing" the cap to the neck. As it turned out the complaint as such was justified, but not for tight caps.

As in most industries, quality is a continuing problem. Statistical quality control, introduced into the industry a decade ago, has greatly helped to improve tube performance and consistency. Constant vigilance, more reliable machinery and, above all, a meeting of the mind with the customer will serve to guarantee uniform, high quality tubes throughout the industry.

All other things being equal, a purchaser generally buys the least expensive product available. Obviously all things concerning tubes are not equal, but many times a lower-priced tube is adequate. In packaging hand cream, appearance is essential, whereas grease or glue may be packed in tubes with the barest decorations.



STRIP-OFF lithographed labels, to serve ethical drug wholesalers, are used for this redesigned ointment line packaged in collapsible metal tubes. Colors are aqua, red and black on white. (*Sheffield Tube photo*)

Aluminum tubes are quoted on a flat price, depending on quantity ordered and on extras. Lead and tin tube prices are based on the market price of metal the day an order is received, plus a fabricating charge. If the purchaser feels he has a grasp of the soft metal market, he may wish to place an order for future delivery, anticipating lower prices. This can be risky. At any rate, the use of the least expensive metal compatible with the product is advised. In this connection, also consider internal lining to aid compatibility. Whenever possible, tube industry standards should be followed for both the tube and the cap. Specials incur tool charges, longer delivery cycles, and sometimes a higher base price.

Be aware of the quality standards followed by the tube manufacturer. If necessary, change to suit your needs—but inform him. A good percentage of quality problems occurs when the manufacturer and customer do not fully understand each other.

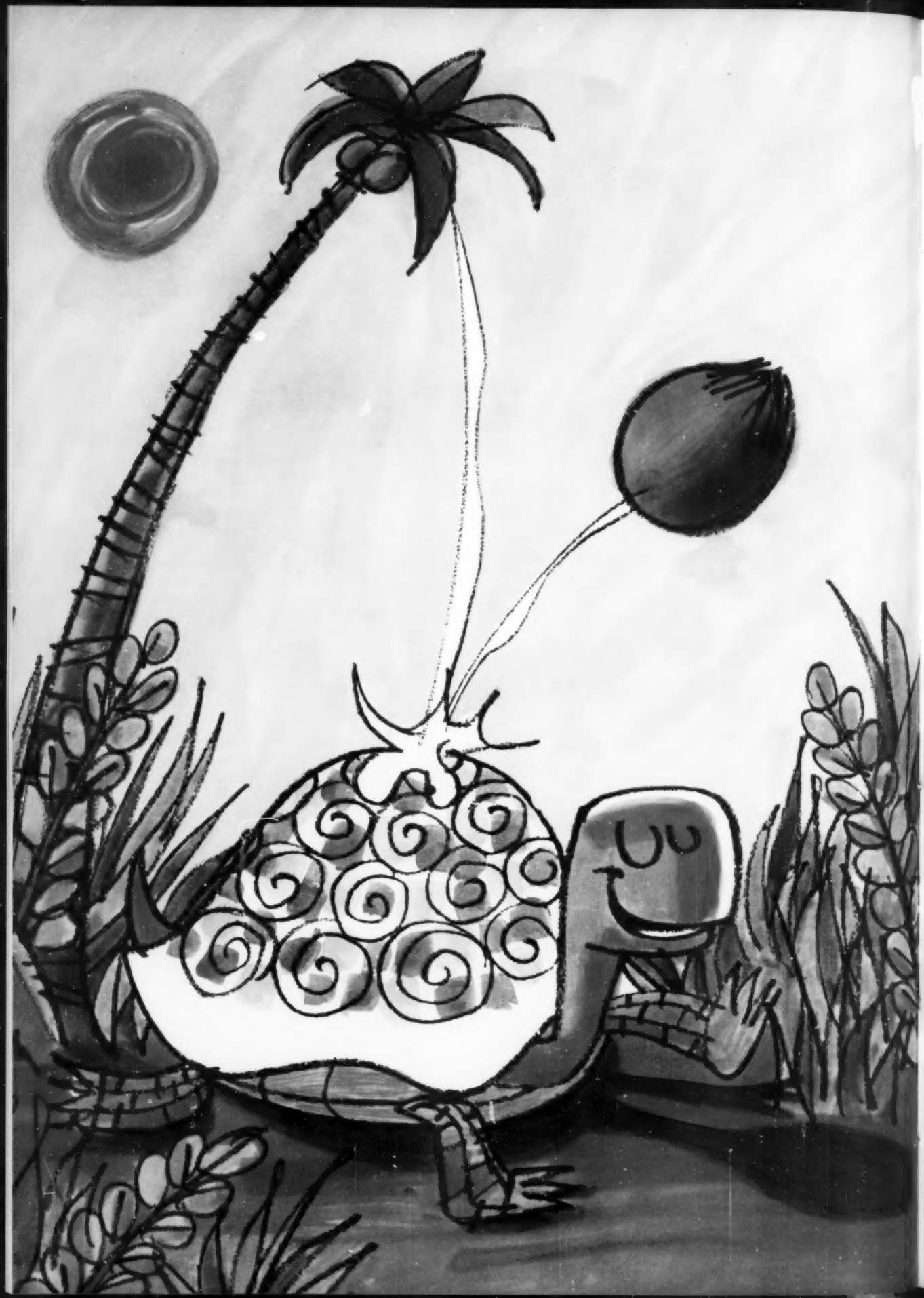
Tubes are custom manufactured. In most cases they cannot be stocked since decorations change, products are dropped, etc. Normal delivery time in the tube industry is three to four weeks. Approximately 50% of tube orders specify delivery as "immediate," "soon as possible," or some such phrase. Consequently, there always are delivery problems. It is important to allow the normal lead time, whenever it is possible.

Table II—Approximate tube capacities and available orifice openings

Diameter x length from shoulder	*Capacity*		*Size opening generally used*	*Maximum size of opening available*
	Fluid ounces	*Cubic centimeters*		
1/2" x 2"	3/16 oz.	5½ c.c.	1/8"—No. 8	3/16"—No. 12
1/2" x 3"	1/4 oz.	7½ c.c.	1/8"—No. 8	3/16"—No. 12
1/2" x 4"	3/8 oz.	11 c.c.	1/8"—No. 8	3/16"—No. 12
5/8" x 2¼"	1/4 oz.	7½ c.c.	5/32"—No. 10	1/4"—No. 16
5/8" x 3½"	1/2 oz.	15 c.c.	5/32"—No. 10	1/4"—No. 16
3/4" x 3"	5/8 oz.	19 c.c.	3/16"—No. 12	1/4"—No. 16
3/4" x 4"	7/8 oz.	26 c.c.	3/16"—No. 12	1/4"—No. 16
7/8" x 4"	1 oz.	30 c.c.	1/4"—No. 16	1/4"—No. 16
7/8" x 4¾"	1⅛ oz.	41 c.c.	1/4"—No. 16	1/4"—No. 16
1" x 4"	1⅛ oz.	41 c.c.	1/4"—No. 16	5/16"—No. 20
1" x 5"	1¼ oz.	52 c.c.	1/4"—No. 16	5/16"—No. 20
1" x 6"	2¼ oz.	67 c.c.	1/4"—No. 16	5/16"—No. 20
1⅛" x 5"	2¼ oz.	67 c.c.	1/4"—No. 16	5/16"—No. 20
1⅛" x 6"	2¾ oz.	81 c.c.	1/4"—No. 16	5/16"—No. 20
1¼" x 5"	2⅝ oz.	78 c.c.	1/4"—No. 16	7/16"—No. 28
1¼" x 6"	3⅜ oz.	100 c.c.	1/4"—No. 16	7/16"—No. 28
1⅜" x 5"	3⅛ oz.	93 c.c.	1/4"—No. 16	7/16"—No. 28
1⅜" x 6"	4 oz.	118 c.c.	1/4"—No. 16	7/16"—No. 28
1½" x 5"	3⅝ oz.	107 c.c.	5/16"—No. 20	7/16"—No. 28
1½" x 6"	4⅝ oz.	137 c.c.	5/16"—No. 20	7/16"—No. 28
1⅝" x 7"	5⅝ oz.	167 c.c.	5/16"—No. 20	7/16"—No. 28
1¾" x 6"	6⅞ oz.	204 c.c.	7/16"—No. 28	7/16"—No. 28
1¾" x 7"	8¼ oz.	244 c.c.	7/16"—No. 28	7/16"—No. 28
2" x 5"	6¾ oz.	200 c.c.	7/16"—No. 28	7/16"—No. 28
2" x 6"	8 oz.	237 c.c.	7/16"—No. 28	7/16"—No. 28
2" x 7"	9⅝ oz.	285 c.c.	7/16"—No. 28	7/16"—No. 28
2" x 8"	11½ oz.	340 c.c.	7/16"—No. 28	7/16"—No. 28
2" x 9"	13½ oz.	400 c.c.	7/16"—No. 28	7/16"—No. 28
2" x 10"	15½ oz.	459 c.c.	7/16"—No. 28	7/16"—No. 28

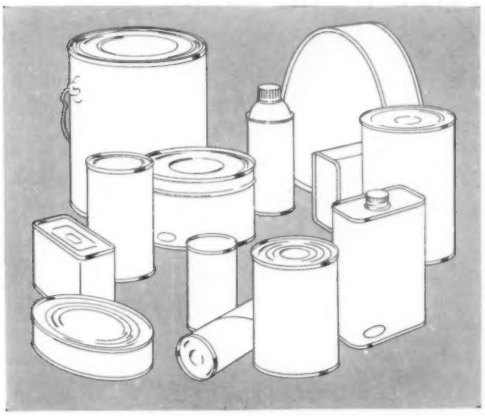
The above capacities are of closed tubes in fluid measure and do not apply to substances of different specific gravity.

Because of the differences in filling technique, these capacities can only be estimated. However, they are approximately correct for tubes with a clip closure. The folds of the clipless closure type usually take up a greater amount of the tube wall than the clip type, consequently the clipless tube will have a somewhat smaller capacity than is indicated in the above table.



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GREAT CONTAINER IDEAS COME FROM CANCO

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Aluminum cans, boxes, drums, cylinders

by J. F. Delany*

Aluminum, after many years on the threshold, now has entered the can market in volume, and the future role played by the lightweight metal in this industry should continue to be on the increase.

Aluminum has many assets as a can-making material. Its characteristics of nonrusting, light weight, pleasing appearance and ease of fabrication are well known. However, as in any competitive industry, basic economics of aluminum as a can-making material are of the uppermost importance for an expanded use of the metal. The main question is: "How much does the finished can cost?" It is in this area that developments regarding aluminum can fabrication—and discovery of new techniques—have made possible an aluminum container which is less costly for many applications and have provided for rapidly increased usage of the lightweight metal by the can-making industry. In 1960, some 40 million pounds of aluminum were used for cans in the United States, and it is estimated that more than 100 million pounds will be used for cans in 1961.

To determine the economic feasibility of aluminum cans versus containers of tinplate or those fabricated from other materials, each specific can application and the can's particular situation in regard to other factors must be studied. Some of the items on a check list which must be covered to decide whether the can should be made of aluminum are: gauge necessary for the can in its application; amount of scrap that will be generated during manufacture; coatings which may be necessary; shape of can, and geographical location of the can manufacturer (which is important because proximity to source of metal supply affects the costs of tinplate, but not aluminum).

As the economics of any aluminum can primarily are based on the method by which it is made, it would be well to discuss various fabricating techniques. Currently, there are four methods of manufacturing rigid-wall aluminum containers:

1. Conventional three-piece fabrication method.
2. Conventional drawing operations (shallow drawn, draw and redraw, reverse draw)
3. Impact extruding
4. Deep drawing; draw and iron.

Conventional three-piece. With conventional three-piece fabricating methods, aluminum basically is used as a substitute for conventional materials, and, with slight modifications (such as use of air, rather than magnet assists), the same fabricating techniques and equipment are used for the aluminum cans as for a tinplate (steel) container. By far the greatest number of aluminum cans fabricated in the United States are conventional three-piece. The Florida citrus pack in the 1960-1961 season alone accounted for approximately 800 million six-ounce, three-piece aluminum cans, or the equivalent of some 26 million pounds of aluminum. Three-piece aluminum cans for motor oil used approximately 30 million pounds in 1960.

Aluminum cans of the three-piece type have limitations for many applications, for aluminum at present cannot be soldered at high speeds. Development work is continuing on improved cements and side-seam structures, but as of now three-piece aluminum cans are not suitable for processing or vacuum packing for large-volume food or pressurized-drink products.

An innovation which merits mention in regard to conventional three-piece manufacture of aluminum cans is the development of portable bodymakers and related can-making equipment which are being used by can manufacturers. Body blanks, or sheets of aluminum body blanks and finished ends, are furnished the can makers and the simplicity of assembling the cans has, at the packing plant, had a further advantageous effect on the over-all economics of the containers. (See also article on can making in Section 14.)

The speeds at which existing machinery can produce aluminum three-piece cans is comparable to that of the fabrication of three-piece cans of tinplate.

Conventional drawing operations. Shallow drawing, draw and re-draw and reverse draw are being used more commonly for manufacture of a wide variety of aluminum cans. The speeds of fabrication in conventional drawing operations depend on the design of the press equipment, tooling and the size of the can. Since many shallow-drawn aluminum cans are produced at speeds up to 400 cans per minute on one press, an answer to the basic question of "what does the finished can cost?" is favorably affected. Examples of current use of these fabricating methods for aluminum cans can be found in the fish, dairy-products, potted-meats and industrial-packaging areas.

A recent development with aluminum cans fabricated by conventional drawing methods is the use of precoated aluminum coil by can manufacturers which has an over-all bearing on the simplicity of the fabricating process. By using such materials, the need for coating presses and ovens is eliminated.

Impact extruding. This method of fabricating metal containers is quite old, and its most familiar application is in the manufacture of collapsible tubes. In impact extruding, slugs of



FABRICATIONS. First two, conventional three-piece cans. Next three, impact extruded. Shallow-drawn cans have tear-off tops. Next to last can is drawn, redrawn. Beer can, drawn and ironed. (*Kaiser Aluminum photo*)

*Manager of Sales, Can Market, Kaiser Aluminum & Chemical Sales, Inc., Oakland, Calif.

aluminum are fed into a press which, through force applied to a punch, causes the metal to "flow" around the punch and out of a die to control the shape of the finished container. Press speeds to 120 cans per minute are attainable through this manufacturing technique, and these speeds are continuing to increase as additional development work continues on can-making impact extrusion presses. Container size limitations are determined strictly by the size of the press: the larger the equipment, the larger the can. Advantages of such containers are: no side seams, for strength, and a wide variety of shapes, for design versatility. A disadvantage of this technique is that control of metal gauge in the can is difficult to achieve, and the choice of alloys is limited. Seven-ounce beer cans, and aerosol containers, produced by impacting currently are on the market.

Deep drawing; draw and iron. In the deep-drawing process, a circle of metal is blanked and drawn by a single stroke of a press from coil sheet and lengthened by progressively reducing its diameter. Deep drawing and ironing is a combination of methods by which a deep-drawn can is further lengthened or deepened and gives an opportunity for preferential placement of metal in the can (heavy bottom, thin wall) in a wider choice of alloys.

It is felt that the future potential of such fabricating systems is great. The resulting can has high strength and exceptionally pleasant appearance. From the can manufacturers' viewpoint, maximum utilization of metal may be achieved. Present plans call for can-body makers and new related equipment for the fabrication of cans by deep drawing and ironing methods at approximately 400 per minute.

Continuing development work is being undertaken by machinery manufacturers to develop improved presses and to perfect new equipment. The size limitation of cans made by the deep-drawing process again is related closely to the total economics of the can. The larger the can, the larger the press and dies, and these affect the over-all economics when the can is critically viewed in relation to containers made from other materials.

Additional characteristics

Along with the previously mentioned characteristics of aluminum which make it an excellent material for rigid cans—light weight, ease of fabrication, corrosion resistance—are the qualities of the metal which adapt it to many finishes. Aluminum may be anodized in any color, polished, etched, painted and printed. The outer surface of the aluminum can has good ink adhesion characteristics, and lithography may be employed in a design which will utilize the natural bright aluminum finish of the can as an eye-appealing background for the printed message.

Whether or not the aluminum can should be coated inside depends on the product it holds. Because of the metal's characteristic resistance to corrosion, many items can be packaged in uncoated aluminum cans. This, naturally, means less manufacturing cost. For most applications, however, an internal coating of lacquer is generally recommended. (See article on can coatings, also in this section.)

Another recent development which is being used with the aluminum can for certain applications, such as in the dairy-product field, is the "easy opening" or "tear strip" top. The top is attached to the body of the can by a unique method. When the tab is pulled it tears the seam so the lid can be removed easily. The lid also has a reclosure feature. Similar developments involve a tab which is pulled to remove the top of a can which has been pre-scored. These containers may be opened without the use of a can opener and, needless to say, afford much in the way of merchandising appeal and customer convenience.

Use of aluminum for cans is not limited strictly to the entire can. Economics of metal and amount of scrap generated during can-fabrication processes many times may dictate the use of aluminum ends on conventional tinplate bodies or bodies made of composite materials. Aluminum ends also are easier to open, and consequently they are gaining in favor in such areas as beer, frozen fruits and other food applications and cleanser containers.

Because aluminum is so versatile, it has numerous applications for larger containers, such as cylinders, barrels, tanks and drums. These larger containers may be fabricated by numerous metal-working methods, such as spinning, stamping, extruding and drawing. Methods of joining aluminum for large containers are varied, and the development of vari-

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Helpful Literature

FREE!

CUSTOM-MADE CORRUGATED BOXES. Illustrated folder describes components for a box-making system that permits you to make corrugated boxes in plant as needed. System includes box-maker, slitter-scorer, and taper. Colt Packaging Machinery Co.

PAPER BOXES AND LABELS. Illustrated 6-page catalog describes wide line of stock, round and rectangular, set-up paper boxes, including telescope, slide, hinged and shoulder types. E. N. Rowell Co.

TRANSPARENT PLASTIC BOXES. 4-page illustrated brochure gives general information on complete line of transparent plastic boxes. Advantages, sizes listed. Vlchek Tool Co., Plastics Div.

FOOD CONTAINERS. Illustrated 4-page catalog of pressure formed, styrene containers for fresh and frozen foods; includes physical and chemical properties, weights, etc. Also information about multi-color graphics. J. E. Plastic Mfg. Co.

VIALS AND TUBES. Illustrated 8-page folder describes a line of resilient, shatterproof, transparent or opaque plastic vials or tubes made by injection molding, extrusion and other methods, depending on end use and volume. Liquid capacities from ¼ to 3 fl. ozs. Lusteriod Container Co.

PAILS & DRUMS. 6-page illustrated brochure describes line of steel pails and drums; also fibre drums. Complete description, advantages, applications, other data. Bennett Industries, Inc.

TEST ABRASER. 12-page illustrated booklet describes precision built test instrument designed to evaluate the resistance of surfaces to rubbing abrasion. Applications include tests of painted, lacquered, electroplated surfaces and plastic coated materials, etc. Complete description, specifications, price list, other data. Taber Instrument Corp.

SHEAR/SCRATCH TESTER. 4-page illustrated bulletin gives operating instructions for testing the surface quality of organic rigid sheet materials and coated surfaces to resist digs, scratches, scrapes and similar damage not classed as normal wear. Taber Instrument Corp.

ADVERTISING SPECIALTIES. Colorful 40-page catalog presents advertising specialty items with full data and prices. Catalog includes order form and samples of promotion material. American Advertising Specialties Co.

CONTRACT PACKAGERS. 6-page brochure describes and illustrates facilities for packaging, marketing and production of aerosol and liquid products. Fluid Chemical Co., Inc.

UNIT PACKAGING. 10-page brochure illustrates and describes in detail unit packaging service which includes warehousing of products in bulk and unit packaging products in endless variations, on advanced machinery. Ivers-Lee Co.

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A service of

MODERN PACKAGING

Encyclopedia Issue

A Breskin Publication

770 Lexington Avenue, New York 21, N.Y.

ous aluminum alloys particularly suitable for welding have proved important in this respect.

With impact extruding, aluminum containers and cylinders of large size can be fabricated on huge presses which make possible ever-increasing lengths and diameters for applications where high strength and seamless structure are needed for the containers and cylinders.

Aluminum's light weight offers handling and transportation benefits for all sizes of containers, and for hauling all types of lading. The metal also offers additional advantages when hauling bulk commodities which are either corrosive to other metals or which are contaminated by the other metals. Examples of such commodities would include foods where steel containers would require some type of lining, but where aluminum may not. There are numerous chemical products such as sulphur, salt, adipic acid and ammonium nitrate crystals which corrode steel but to which aluminum is largely or even completely impervious.

Use of aluminum in the area of "small" containers ("small" in contrast to van containers which can be described roughly as 8 ft. by 8 ft. by 17 ft., or larger) is expected to continue to expand rapidly. A sizable portion of this growth would involve aluminum being utilized for the transportation and temporary storage of dry bulk products.

Other aluminum containers, such as beer barrels and drums, also are popular. Main attribute which the metal affords for these applications is light weight, which reduces handling and haulage costs. For certain applications, high-purity aluminum cladding affords extra resistance to corrosion for the container.

Compatibility studies are being conducted to determine the feasibility of aluminum for many types of containers. These studies are recording the performance of the metal under normal and severe shipping conditions, with a determination also being recorded as to how the material being transported affects the aluminum, and how the aluminum in any way might affect the commodity. Studies such as this will have a favorable bearing on determining the specific applications in which aluminum is the best possible material from which drums, barrels and containers should be fabricated.

FOIL CONTAINERS—"total packaging"

by Ramon G. Gaulke*

Aluminum-foil packaging now offers a total-package concept. Until recently foil was considered only a pan. Today, the development of new materials combined with advances in packaging, merchandising and consumer needs makes aluminum-foil containers a logical answer to complex packaging and marketing situations. Board and overwrap methods now have been joined by plastic covers, heat-shrink films and hermetic heat-seal closures as methods of completing foil pan-packages.

New plastic cover sizes are being offered either decorated or plain. These covers can be applied manually for limited volume use or market testing. Automatic equipment is available to volume users. Plastic covers are manufactured from oriented polystyrene and are strong enough to permit sales building point-of-purchase displays. These strong transparent covers also protect products from damage and prolong shelf life. Applications include bakery products, candy, ice cream, restaurant carry-out items, meat, seafood, poultry and nonfood items.

Heat shrink films now offer foil containers a low-cost closure plus maximum protection. Film covers cling to the rim of either round or rectangular foil containers and protect the contents until purchased. Applications include not only bakery items, frozen foods and restaurant carry-out items but also nonfood products.

Hermetic foil packaging now has become a reality for a variety of users including institutional packers of jams, jellies, syrups, toppings and condiments. In addition, frozen food packers, dry product packers and industrial caterers have found that the airtight and moistureproof advantages of hermetic aluminum foil provide exceptionally good product protection and consumer convenience.

Because smoothfoil assures a completely wrinkle-free foil container with an absolutely flat rim, the foil cover can be heat sealed to the rim—thereby providing a truly airtight package.

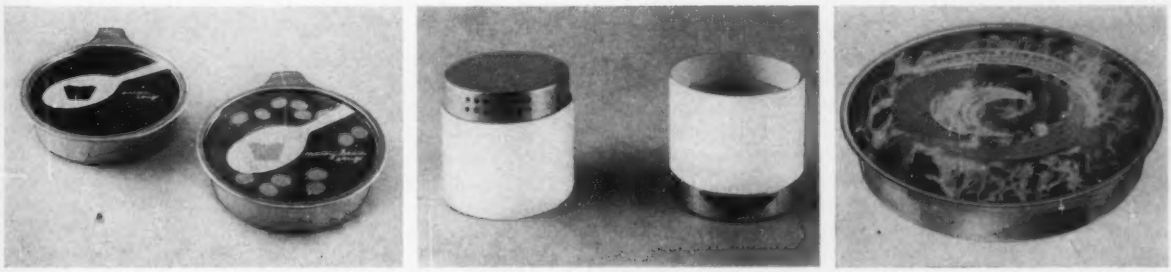
Hermetic packages employ a pull-tab cover for easy opening and offer complete product accessibility, product protection, labor-saving disposability, portion control and unequaled convenience. Variety of preparation method is still another advantage because hermetic packages can be boiled, baked or broiled or can be heated on top of the burner.

For jams, jellies and other smaller-size portion-control packages, containers are available in a capacity range from ½ to 3 fluid ounces. Products packed in hermetic foil packages will not deteriorate due to oxidation, moisture loss or the absorption and/or evaporation of essential oils.

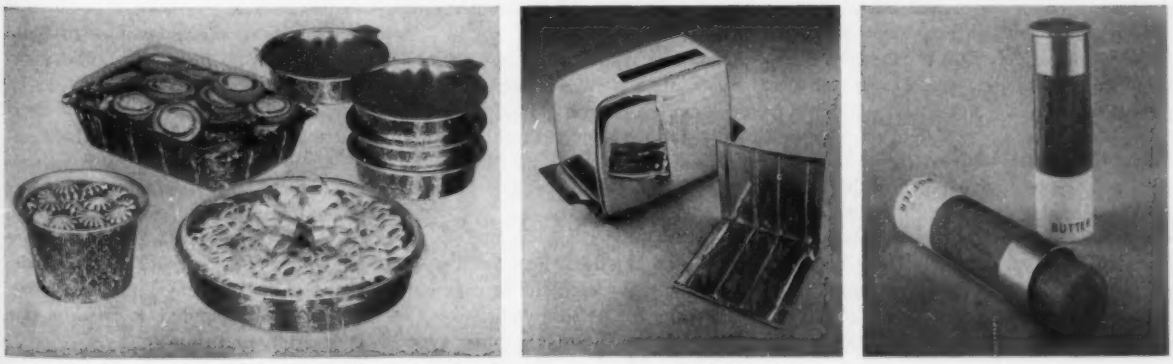
Other applications for small hermetic packages include syrups, toppings, salad dressings, powdered sugar, citrus concentrates, coffee, dehydrated foods, cosmetics, drugs and electronic parts.

Larger-size hermetic packages can be used for the packaging of frozen

*Advertising and Sales Promotion Manager, Ekco-Alcoa Containers, Inc., Wheeling, Ill.



IDEA PACKAGES suggest both novel and practical uses for aluminum foil containers. *Above, left:* Attractive hermetic foil container for soup. *Center:* Unique new sugar and spice table packages. *Right:* Foil baked goods container with see-through polystyrene lid that attracts and also preserves freshness. *Below, left:* Over-all display of container types for candies, baked goods. *Center:* Idea package for toast-and-serve bacon. *Right:* A functional butter-stick, also attractive enough for table service. (*Ekco-Alcoa photos*)



foods, cereals, chemicals and other products of a similar nature.



CONVENIENCE PACKAGE, a six-muffin aluminum container, is shown here before baking (above) and 20 minutes later, after baking (below). No defrosting is necessary. Container is deep-drawn, fitted with a plug board lid which provides product protection when containers are stacked. (*Kaiser Aluminum photo*)

Sized for the market

The convenience and performance advantages of foil packaging, although initially introduced to the bakery and frozen-food industry, are now being extended to vending, school feeding, restaurants, hospitals, industrial catering, nurseries, fresh meat, ice cream, candy and also to numerous other applications.

Today's total-concept foil package comes in a variety of shapes and sizes. Heart-shaped pans, containers shaped like frying pans, fluted cups, ribbed foil, seafood shapes and a variety of oblong, round and square foil pans offer packaging-marketing specialists a package to suit exact specifications. Forecasts call for specially shaped pans to be introduced for theme-related Christmas, birthday, Mother's Day and other special occasions.

Color coatings help give the total foil package unequaled merchandising advantages. Solid aluminum foil coatings are currently available for use inside or outside the container. A recent introduction is the over-all pattern which allows a user to print his logotype or trademark in a continuing pattern on the foil package. All colors or patterns have been developed to resist heat discoloration, and coatings that bear F&DA acceptance are now available.

Functional coatings have been added also, to enhance the already superior performance advantages of the foil package. The partially coated black-bottom pie plate, for example, employs a scientifically spotted black coating on the bottom of the pan. This coating absorbs more heat faster to insure an evenly baked bottom crust on pies and pizzas. This same coating can be applied to TV dinners to regulate and control the temperatures of frozen products which require more heat. Laboratory tests conducted with this special black-bottom coating have proved conclusively that it can reduce the baking time of a fresh or frozen pie 20 to 30%.

High-speed packaging

The increased availability of high-speed packaging equipment is enabling volume users to realize the advantages of aluminum packaging. Container manufacturers have developed high-speed equipment to feed, fill and close containers today at rates of 3,000 to 6,000 units per hour. This equipment can be tied into existing packaging production-line equipment, and operated with standard filling and in-plant conveyor systems.

Automatic equipment to apply printed light-gauge foil hoods, in register, to round or rectangular aluminum foil containers is operational, and new semi-automatic and fully automatic units to hermetically seal aluminum foil containers have been announced. These units will seal a variety of cover materials to smoothfoil aluminum containers and will produce, for the first time, a completely airtight and moistureproof aluminum foil package. The resulting gains in filling and closing efficiency mean that volume packaging in foil for mass distribution is becoming a very practical reality.

Fabrication

The gauges used in the manufacture of rigid aluminum-foil containers range from 0.0020 to 0.010 in., the latter being light aluminum sheet.

As a packaging material, aluminum provides a lightweight container weighing less than 1/10 lb. per cubic inch. Its melt range is 1,190 to 1,215 deg. F. It has excellent heat conductivity and light reflectivity. Aluminum foil is opaque, moistureproof, gasproof, greaseproof, odorless, tasteless and nontoxic. It is dimensionally stable and possesses outstanding strength.

Aluminum is fabricated in a variety of ways into several different types of containers. The rigidity and strength of the containers depend on the physical design of the container, the gauge of the foil and the temper of the metal.

Most containers are formed by a single stroke of a die. These are identified by the characteristic corrugation or wrinkling of the side walls.

Curled rim. The most popular type of foil pan has a full-curl rim, a tightly rolled and beaded rim that increases rigidity and lends itself ideally to boxing and overwrapping with a wide variety of materials. Recent machine developments have made possible new economies in hooding full-curl containers with light-gauge aluminum foil ranging from 0.001 to 0.0015 inches. The hoods offer additional product protection. Skirted foil hoods made of heavy-gauge foil or transparent polystyrene also can be snapped on to curled-rim containers.

A second type of container rim that has proved exceedingly popular and practical is the *vertical-flange container,* which accepts a flat lid. The rim of the container crimps over the lid to provide a tight closure. A variation is the *vertical-curl flange,* which has a beaded edge. Many types of covers are available, the most common being foil-laminated bleached sulphite board, preferably manufactured by the Fourdrinier process to minimize the possibility of warpage. For particularly attractive products, these covers can be windowed with moistureproof cellophane or polyester film. Printed transparent polystyrene covers offer maximum visibility plus flexibility of cover design.

The skill and imagination of the users and manufacturers of aluminum-foil containers are evidenced by the more than 700 container sizes and shapes offered.

Patty pans range from 3- to 5-in., pie plates from 6- to 10-in., and pizza pans are offered in 8-, 9- and 12-in. diameters. Round casseroles and deeper containers are manufactured in diameters of from 5 to 9 inches.

Rectangular and square containers in capacities from 9 to 100 fluid oz., with depths from 1 to 2½ in., now are enjoying the fastest rate of growth because of their storage and marketing advantages. Included is the popular compartmented dinner tray.



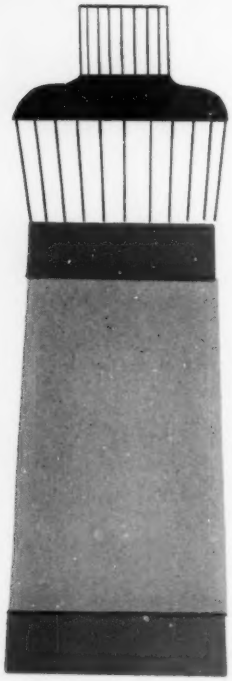
Photographed for Alcoa by Paul Wing

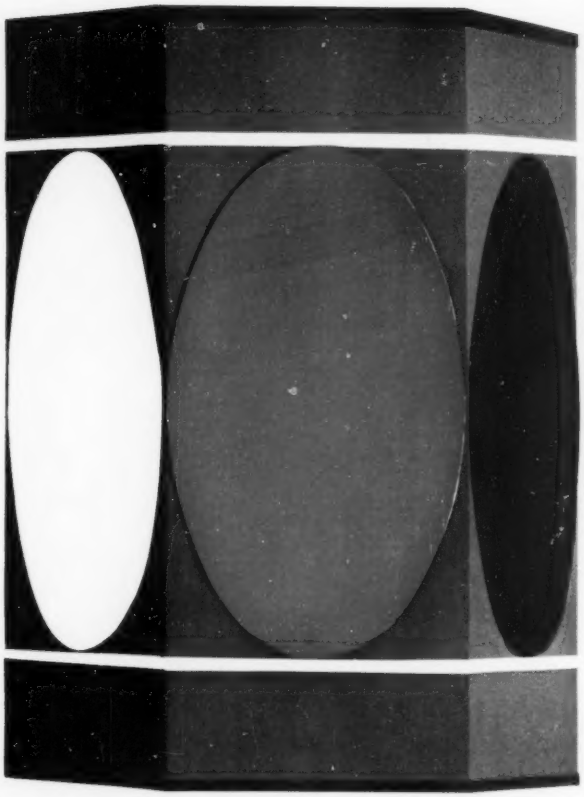
What took the weight out of can freight? Aluminum did. The proof is on the shipping bills. Take cans made of Alcoa® Aluminum. They ride at far less cost than ordinary cans. They're lighter. Billions of cans will hit the road this year. But the ones that will save someone a lot of money are those that take the weight out of freight. Cans of aluminum . . . Aluminum from Alcoa.

Your partner for better packaging

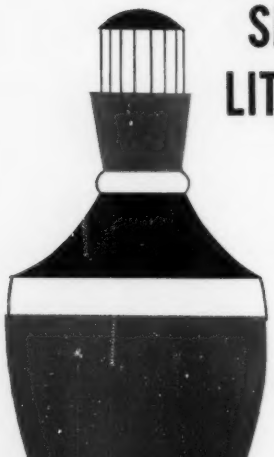
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SP'INKLE, SP'INKLE, LITTLE STAR

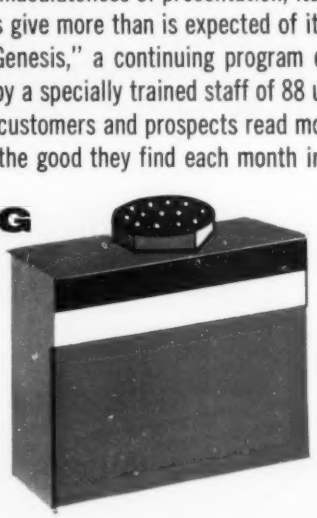


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MODERN PACKAGING

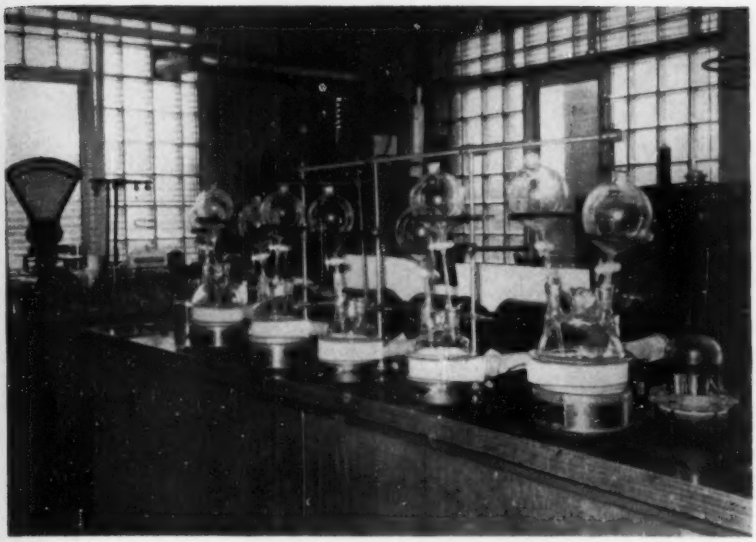
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Coatings for metal containers

by M. O. Baddeloo*



DETERMINING EXTRACTABLES for F&DA approval is carried on in this laboratory. The subject of coatings analysis assumes new interest with the wider use of coatings and the need for utmost care in determining their safe usage. (*Stoner-Mudge Co. photo*)

In 1810, Durand and Hall made the first tin canister in England. This was the beginning of what today is the great food and beverage packaging industry.

The first cans were unlined but protected with a layer of tin deposited by a hot dip method over iron. These containers were handmade, crude and heavy, but they filled a need and caught on rapidly. By 1823 there were several canneries in operation in New England. Naturally, only a limited number of materials could be packaged in this manner and the efficiency of the operation left much to be desired.

Organic linings were first applied to the containers about 1910. A material that is essentially still in use today—an oleoresinous gold coating containing zinc oxide and commonly identified as a "C" enamel—was first employed about 1924. From these early beginnings a half century ago, a complex and intricate series of resins—natural and synthetic—has evolved to provide the gamut of container linings available today for packaging everything from apple butter to zinc chloride.

Needless to say, those first coatings could not do the whole job. As more and more materials found their way into this type of packaging, the need for additional and better linings became evident, and the great search began.

Coatings were sought that would: (a) provide corrosion resistance; (b) protect the packaged product from the container; (c) protect the container from the product; (d) protect and maintain flavor; (e) facilitate fabrication; (f) permit the use of more economical tin weights and (g) improve appearance.

The great complexity of coating types available today includes acrylics, epoxies, phenolics, urea-formaldehydes, vinyls, and so forth. The many different natural and synthetic resins are compounded in an almost infinite number of ratios and mixtures.

Although "the universal coating" that will do every job is everyone's dream, it is almost certainly still a dream. Many coatings do many things, but a material that performs excellently in one application may be completely unsatisfactory for the next product. This means that a great deal of laboratory work and experimental test pack data must be accumulated before a new product can be packaged with a new lining.

However, by now, a great deal of background information and knowledge has been accumulated. We know that modified phenolics do an excellent job for packaging meats and fish, and that oleoresinous-based coatings with zinc oxide prevent sulphur-bearing foods fron staining the tin can, and the delicate and distinctive flavor of beer will be preserved in a

General properties of typical can-lining resins

Rating scale: 1 = good 2 = fair 3 = poor

Coating-type resin	*Flavor*	*Flexibility*	*Adhesion*	*Color*	*Cost*	*Solder-damage resistance*	*Sterilization resistance*	*Acid resistance*	*Alkali resistance*
Acrylics	1	1	1	1	3	1	1	1	1
Alkyds	3	2	1	2	1	2	2	2	3
Epoxy-amine	1	1	1	1	2	1	1	1	1
Epoxy-ester	2	1	1	2	2	2	1	1	2
Epoxy-phenolic	1	1	1	3	2	1	1	1	2
Oleoresinous	2	1	1	2	1	2	1	1	3
Phenolic	2	2	1	3	1	1	1	1	3
Polybutadiene	2	2	1	2	1	1	1	1	1
Vinyl	1	1	2	1	3	3	2	1	1

*Coordinator of Advertising, Stoner-Mudge Co., Div. of American-Marietta Co., Pittsburgh, Pa.



BOTH sides of these aluminum cheese containers are pre-coated—inside with clear vinyl, outside with pigmented modified vinyl in a different color for each flavor. (*Stoner-Mudge Co. coatings*)



TESTING. Weight of tinplating is determined by stripping the coating from samples. (*Military Subsistance Testing Lab. method*)

can with a vinyl lining, and that drums coated with a thermosetting epoxy will provide a means of shipping fats, oil and other products of a similar nature.

These and many other things are known but the constant introduction of new products requires a continuous effort for new and better linings—and new and better means of application and production. Not long ago all cans were produced from flat sheets of metal approximately two feet square coated by a direct roll-coating process at the rate of 40 to 60 sheets per minute and baked for periods of up to 15 or 20 minutes. Today, work is under way to coat continuous lengths of coil, on both sides at one time and at the rate of 150 feet per minute, and bake the coatings in a matter of seconds.

Some cans—in addition to receiving an interior prime coat applied by roll coating—also receive a final spray coat after the can body has been formed. This method provides a real advantage in that mechanical scratches and abrasions due to handling during fabrication and forming are practically eliminated and a continuous film is laid over the can seam.

For those cans without seams—for example, the aluminum can that is drawn from a blank—a coating may be provided that will apply in the flat and then withstand the severe drawing and fabrication necessary to the can-making operation.

Other applications involve complete spray application as in the making of drums, or the lining of impact-extruded aluminum cans.

An example of a complete coating operation is illustrated in the tables on this page, using a typical tin-plate beer or soft drink can-coating system and sequence. The operations are different and separate for bodies and ends so each operation is described individually.

The total amount of lining on the interior of the beer or beverage can described in the tables is less than a half gram. An analytical balance is required to measure the individual costs. There is a lot of work involved in getting these "smidgins of science" where they belong.

The number and variety of coatings required for the applications in the tables are typical of the problems that arise with the various packages. The prime coats must be chosen to provide the sealing and fabricating properties required as well as to serve as a base for adhesion of subsequent topcoats. The topcoats must be flexible and continuous, serve as an inert barrier to prevent flavor change, and require only a low bake in order not to affect the interior colors and prints. At all times, cost must be kept to a minimum, naturally, and all coatings must be safe for food packaging and be accepted by the F&DA.

The F&DA requirements for coatings are defined in Public Law 85-929. This law, passed in 1958, is better known as the Food Additives Law and the purpose is: "To protect the public health by amending the Federal Food, Drug & Cosmetic Act to prohibit the use in foods of additives which have not been adequately tested to establish their safety."

The result of the law has been that a long, hard look has been or is being taken at all components of food-container linings. A very significant sum of money and time has been expended by coating manufacturers, their raw material suppliers and the container producers to determine that there are no toxic or unknown extractable ingredients in any food-grade coating. The proof of safety has been put on the packer, and specific approval of a lining system is required for a given end use. Final date for approvals has been extended to June, 1964, but reports indicating diligence and progress must be provided for all materials not yet sanctioned but whose use has been extended temporarily by F&DA review.

All of this adds up to a gigantic effort by many men in several fields to produce that necessary "little bit of science" that goes into a can to better protect and serve the consumer.

Beverage-can coatings—ends

Step	*Side*	*Process*	*Coating*[1]
1	Interior	Prime coat	Oleoresinous
2	Interior	Printing	Inks
3	Exterior	Varnish	Thermosetting vinyl
4	Exterior	Topcoat	Modified vinyl

All four steps are roller coated on flat sheets. After baking, the ends are fabricated and one end sealed on to the body by the can manufacturer. The other end is sealed on by the packer after the filling has been done.

1 Indicates one possibility; other types of coatings may also be used for some applications.

Beverage-can coatings—bodies

Step	*Side*	*Process*	*Coating*[1]
1	Interior	Prime coat	Epoxy
2	Exterior	Litho base	Alkyd
3	Exterior	Printing	Inks
4	Exterior	Varnish	Modified alkyd
5	Interior	Seam stripe	Stabilized vinyl
6	Interior	Topcoat	Modified vinyl

Steps 1 through 4 are roller-coat applied to flat sheets. After proper curing the sheets are split and can bodies made. Step 5 is accomplished, essentially, simultaneously with the soldering of the seam. Step 6 is a spray application after the body is completely formed.



This little shaver likes Peerless

Markets grow up overnight. The youngster who has turned to metal tubes for everything from cut fingers to gleaming smile just naturally keeps the habit as a man.

That is why so many big brands prefer Peerless tubes. Tubes that assure precisely-right closures, coatings and liners for any product. Tubes that command attention with clean, crisp colors and easily-recognized design clarity.

Peerless invites your inquiry on any product that deserves a brighter brand sight in a growing market.

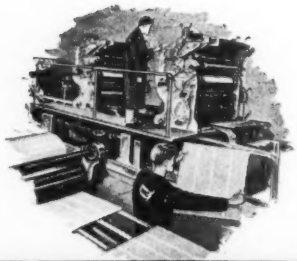
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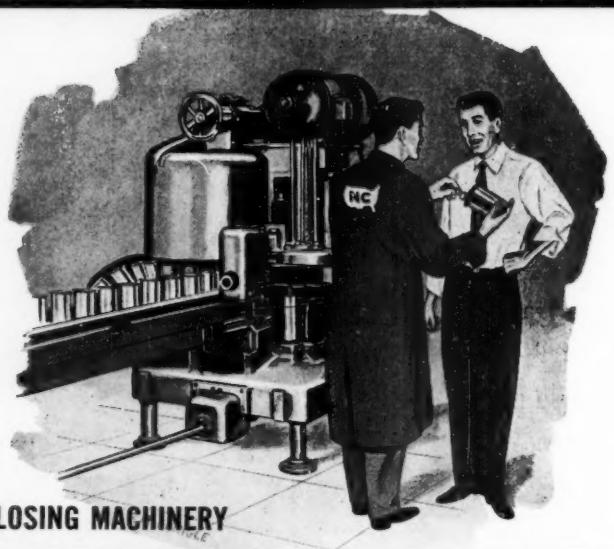
PRODUCT RESEARCH



ENGINEERING



LITHOGRAPHY



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NATIONAL CAN

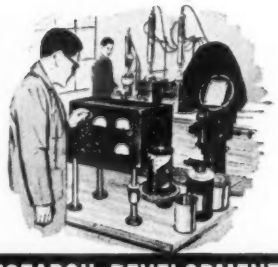
Personal Service



SALES SERVICE



DESIGN



RESEARCH DEVELOPMENT

Combine a keen and personal interest in your products and your processes with our sincere desire to be of help . . . and you have *NATIONAL CAN'S — "Personal Service!"* Why not let us survey your needs — you'll see how much more you get from NATIONAL CAN.



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Advertisers' Index by Subject Matter

GLASS PACKAGES, CLOSURES, CAPS

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SECTION 10

GLASS PACKAGES, CLOSURES, CAPS

Glass—the modern convenience package

Profitable and effective packaging-merchandising based on the use of glass containers will expand in 1962. The underlying factors for this are clearly discernible and await proper study and application to assure new and continuing gains. Among the developments that will add to the already large areas of glass packaging know-how and opportunity are these:

1. *The increased emphasis on convenience.* The tremendous gains made by convenience containers such as the one-trip, handy beer and beverage bottles and compact lighter-weight food containers indicate that there is a large new area of opportunity for these products.

For example, statistics reported for the first half of 1961 by the Glass Container Manufacturers Institute (GCMI) showed that the largest percentage increases for glass containers of all types occurred in the area of nonreturnable bottles for beer and soft drinks. Both categories reached all-time highs.

Shipments of nonreturnable bottles for beer totaled 1.4 billion units, an increase of 60% above the 879.3 million units shipped during the first half of 1960.

Shipments of nonreturnables for soft drinks established an all-time high, too. The six-month period saw a 63.9% growth over the previous peak recorded in 1960. GCMI figures showed that 193.1 million units were shipped in the first six months of 1961, compared with 117.8 million bottles in the like period of 1960.

Convenience, combined with other packaging advantages, has been a major factor in the use of glass for many modern food products. There has been notable success in the packaging of specialty foods in glass. Sales appeal, quick identification, quality and the economy of glass are important factors, but in addition there is the convenience of glass for protection, storing, table use and easy opening and reclosure. This convenience is readily appreciated when one studies the factors that have made baby foods and instant beverages so successful.

2. *Redesigning for lighter weight.* Continuing advances are being made in reducing the weight of glass bottles and jars, and at no sacrifice in strength. This is being accomplished through scientific approaches to glass container design as well as to advances in the science of batch formulation and the control of uniform container quality.

3. *Surface treatments of glass containers to preserve original strength.* In recent years, several coatings have been developed to minimize surface damage to glass containers and thus enable them to be handled better on high-speed lines as well as in distribution and at point of use. Such coatings, when properly chosen for a specific packaging application, can contribute significantly to faster packaging-line operations and greater reliability of the container for intended use.

4. *Improved quality.* During recent years much effort has gone into the development of electronic or similar advanced inspection systems. Just as the packer has looked for new methods in the field of automation, so has his counterpart, the glass supplier, been striving to improve his productivity as he simultaneously lightweights the individual container. Not only are more containers inspected, but also the inspection is better. One of the safeguards employed to assure glass functional ability on a high-speed filling line has been the use of automatic electronic inspectors. These unique devices range from the now universally accepted electric-eye check-inspector to such innovations as electronic plug gauges which measure neck diameters. A new machine has been developed that automatically and simultaneously inspects for height, cocked necks, and out-of-round body dimensions. Additional gains for packagers are foreseen with greater control of wall thickness uniformity.

5. *Styling.* A number of important design trends for glass can be observed. The slim-waisted, shouldered styles for cleaners are a good example. So, too, are the distinctive new shapes seen for spices, mustard and a range of food products. The trend appears to be in the direction of a more appropriate appearance—not just attractive design, but also distinctive design that expresses or dramatizes the true character or personality of the product. Packagers have been scoring new successes with new closure styles. For example, tumblers have shown a resurgence with the advent of a snap reseal vacuum cap. The successful use of closures as a sales aid by providing ample price-marking space should be noted. The vacuum lug closure for baby foods, of course, has been one of the recent important gains in glass packaging.

Many packagers are finding new merchandising advantages in the adoption of private-mold designs. This has occurred for certain brands of instant coffee. As competition increases and more brands fight for a share of a given market, private-mold

design becomes an exclusive merchandising asset for the packager and a very effective weapon against imitation and sameness.

Also from a styling point of view, packagers can employ glass containers to capitalize on the liking homemakers have for "table packages"—those that are socially acceptable on kitchen or dinner tables. Many graceful and uniquely attractive glass containers have been designed to meet this demand. They often have a convenience aspect, as well as aesthetic appeal, because they save time and effort. Pickles, spices, instant coffee, condiments, sauces and similar foods can benefit from this trend.

Excellent examples of intricately shaped glass containers have been introduced recently for cosmetics and personal grooming products. Significantly, these intricate shapes are produced on high-speed lines, and thus the outlook for using attractive designs more extensively is promising.

6. *Machinery developments.* Among the significant advances in glass packaging is a truly unusual effort on the part of six-pack carton manufacturers and breweries to develop mechanical carton packing of bottled beer. Methods to reduce materials costs (such as the elimination of partitions in some instances), and speeds approaching 100 or more six-packs a minute, have resulted. The movement is spreading and more progress is expected.

New machinery is available for wrapping bottles in the brewery and beverage plant, forming three-, six- or eight-pack carriers. Used with open trays, these carriers are becoming quite popular and economical. They have a significant merchandising aspect, for they encourage shoppers to buy multiple units.

7. *Handling systems.* Palletless systems for handling glass containers offer important opportunities for reducing costs. Carton flaps are used in one system. A specially scored wrapper is used in another. A unit load is thus created for fork truck handling. Users of these methods report fine results.

8. *Food and Drug acceptance.* Glass containers have been given complete clearance. The standard types of coatings, when used in right amounts, are acceptable. Closures for all practical purposes present no problem, although there are materials still awaiting approval.

Properly selected and used, a glass container is an extremely effective, modern package that excels in three major areas of packaging and merchandising: namely, protection, self-selling and convenience. Glass containers have an unusually wide range of use in packaging and probably serve more varying requirements for protection, merchandising, consumer convenience and luxury or economy than any other type of package.

There are any number of reasons why glass may be a good candidate for your product. Usually, the selection of any particular type and style of package becomes a matter of choosing the best combination of advantages that any one of several types of containers has to offer.

A check list of your product packaging requirements will readily help determine when and to what extent glass should be considered.

Inertness. If the product demands chemical inertness, glass must certainly be considered. For certain products such as drugs and pharmaceuticals and for many foods such as pickles, ketchup and mayonnaise, and for beverages such as whiskey and wine, glass is practically the only choice.

Visibility. If your product is good to look at, or if instant identification of product type, quality and quantity in the container is a factor, glass should be considered. Visibility is important from the standpoint of attractiveness, but equally important is the contribution visibility can make in speeding up turnover and store traffic. The users of transparent, flexible packages have long since proved the virtue of product visibility for impulse selling. According to more than one marketing authority, there undoubtedly is room for merchandisers to use glass visibility much more strategically and successfully in self service.

Strength, rigidity and shelf life. If your product requires long shelf life in either distribution or use, glass may be your answer. Glass does not deteriorate, it does not dent and with a proper closure provides a 100% barrier of protection against practically every element except light. Colored glass or all-over labeling can give protection against light rays where required. If your product demands protection against moisture, or if moisture retention is critical, or if you have an odor-flavor problem, or if purity is a paramount consideration, the 100% barrier function of glass is important.

Reclosure. If your product is not



TABLE JARS are made additionally attractive with solid ceramic colors sprayed over the surface and with miniature built-in handles. *(Owens-Illinois photo)*



NONRETURNABLE bottles for soft drink feature both packaging-cost savings and convenience for store and customer. Wraparound labeling is used instead of integral labeling, and foil-laminated one-trip carrier is used instead of the basket type for multipacks. *(Foil labels, Reynolds Metals Co.; multipack, Mead Corp.)*

Coatings for glass—comparison of properties*

	Sulfur	*Metallic oxides*	*Non-permanent wax type*	*Semi-permanent wax type*	*Resins*	*Silicone oils*
Invisible film	No	Iridescent sheen	Yes	Yes	Varies[1]	Yes
Easily applied—as by spray from water solution, or as a gas	Yes	No	Yes	Yes	Yes	Yes
Water insoluble after application (hot and cold water)	No	Yes	No	Yes	Varies[1]	Yes
Water wettable after application	Yes	Yes	Yes	Yes	Yes	No
Good lubricity—wet and dry	No	Yes (dry)	No	Yes	Varies[1]	Yes—dry wet[1]
High puncture strength of film	No	Yes	Yes	Yes	Yes	No
Nontoxic	Yes	Yes	Yes	Yes	Yes	Yes
Permits easy labeling (hold labels)	Yes	Yes	Yes	Yes	Yes	No

* Basic form and information for this table developed by Anchor Hocking Glass Corp.
1 Possible weakness in material for property so marked. Further development seems to be needed.

used up in a single use or serving, glass may be a preferred candidate because modern closures make opening and reclosing an easy affair. Also, glass is ideal as a storage container, as witness jars which are used for baby foods and soluble coffee, bottles for milk, wine or medicines.

Modern closures and fitments (see pp. 364 and 369) offer practically any type of dispensing function that your customers may desire. Roll-on fitments for deodorant vials, for example, rapidly made best sellers of products in this type of package. Also, under the heading of convenience or work-saver packages, is the fact that glass lends itself to efficiencies such as heating foods in the container, serving them in the containers and also an option as to throwaway or re-use. Visibility, of course, is a convenience in helping customers consume unused quantities before the contents become old and also signals when to repurchase. Since convenience packaging is recognized as one of the major ways to win and hold customer acceptance for a product, the convenience features of glass receive continuing study by leading marketers and by the most successful packagers.

Package personality. If your product requires package individuality, glass has intriguing advantages. More than 13,000 different molds and sizes are available. Traditional shapes and styles help customers identify products such as ketchup, mustard, vinegar, wine and milk. Or private designs can be employed—containers for Coca-Cola, Matchabelli perfume and Vick's Vapo-Rub are good examples—to give instant brand identity.

Many decorative treatments can be employed to enhance the attractiveness of glass, including fired-on ceramic coloring, labels, cellulose seals and a wide choice of styles, shapes and materials for closures.

Add to these considerations the fact that people like glass containers and generally associate quality and purity with products packaged in glass.

Economy. If your product demands certain of the above-listed qualities, glass may prove the most economical container you can use. Returnable bottles for milk, beer and beverages are probably the lowest cost containers found in packaging—averaging less than half a cent per trip.

The no-deposit glass container also offers economy and in many instances competes favorably with other containers even when allowing the advantage of lighter weight to the competitor.

In this connection an important fact to keep in mind is that glass is made from sand, the cheapest and most plentiful raw material used in any type of package. Delivered glass containers cost as little as seven cents a pound. Contrast this with the fact that bleached kraft food board at the mill is about 10 cents a pound. Tinplate, before fabrication, is about 10 cents and plastic resins, also before conversion, cost from 20 to 35 cents a pound and higher. Even with a yield as low as two or three containers per pound, the unit cost of glass is quite favorable.

Surface areas of solids having volume of one cu. inch*

Sphere		4.85 sq. in.
Cube		6.00 sq. in.
Cylinder	$H = D$	5.5[illegible] sq. in.
	$H = 2D$	5.84 sq. in.
	$H = 3D$	6.21 sq. in.
	$H = \frac{D}{2}$	5.86 sq. in.
	$H = \frac{D}{3}$	6.40 sq. in

In cylindrical shapes, the more the height differs from the diameter, the more material is required to contain a given volume. Additional weight can run 5 to 10% as a result of shape alone.

* Prepared by Harold L. Eastman, Mgr., Statistical Quality Control, Anchor Hocking Glass Corp.

Basic considerations

In selecting and using glass containers, it is desirable for those involved in packaging to understand a few basics. Structurally, the strongest shape that could be specified would be a sphere. This would also be the easiest, fastest and least expensive form to produce. However, a glass container must have a flat base for stacking. It must have an opening suitable to the product that is being filled into and dispensed from it. It may require a long neck for pouring or a wide-mouth opening for large solid products. It will require extra strength in certain areas, such as the neck which must take considerable thrust in closing. Vertical exterior walls are desirable for easy labeling. Simple cylindrical shape is desirable from the standpoint of materials economy, ease of manufacture and handling. Moreover, the simpler molds last longer and require less repair. Complicated molds wear faster, lose sharpness of detail and vary in dimensional tolerance.

Thus even before the packager has

begun to consider his individual requirements for size, individuality and the like, certain factors have been imposed, and some of these will tend to move away from the ideal in strength and economy.

The packager must also understand that glass varies within tolerances. For this reason, gross weighing is out. As a general rule, standard capacity tolerance in a 1-oz. capacity bottle will be as much as 3/64 oz.; weight tolerance, about 1/8 oz.; and dimensional tolerance, 1/32 inch. In a 32-oz. or quart bottle capacity tolerance will run as much as 3/8 oz.; weight tolerance, 3/4 oz. and dimensional tolerance plus or minus 1/16 inch.

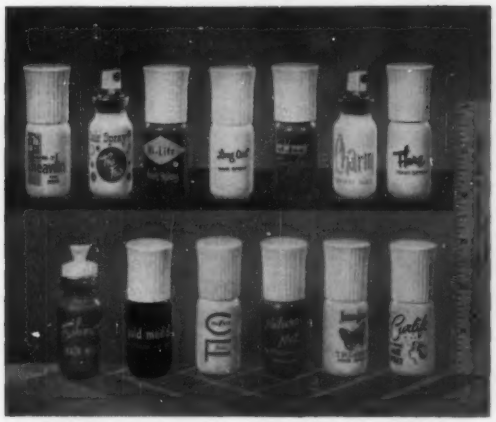
The packager, too, must realize his filling line is not an obstacle course for determining the survival of the fittest. Retention of the maximum strength glassmakers can build into a modern container depends on the preservation of the surface. Nicks, scratches, bumps and impacts operate like a glass cutter to start initial, unseen damage that may later result in breakage when further abuse occurs. It can be assumed that any excessively noisy line, with glass bumping against glass, signals room for improvement when higher speeds are desired. Moreover, with line speeds increasing, preservation of original strength becomes increasingly important, for impact force increases in ratio to the square of the velocity. High-speed lines therefore mean additional demands on the glassmaker, the manufacturers of packaging line equipment and the operator of the line.

Coatings. Since prevention of surface damage preserves the original high strength of glass, coatings that prevent the damage of bumps and scratches and provide lubricity to prevent seizing, galling and jamming are of considerable interest for certain types of containers and particularly on high-speed lines.

There are two principal differences in coating processes. Some coatings are applied in the lehr during the annealing process when the glass is being cooled from forming to room temperature. Coatings of this type are polyoxyethylene stearate and polyethylene glycol; both give lubricity and gloss. Application is made at about 250 deg. F. to avoid thermal shock. However, the coating comes off in a water rinse and protection exists only from the lehr until the container is delivered to the filling line.



RE-USE apothecary bottle has a frosted screw-type polyethylene closure, label in debossed panel. *(Donald Deskey design)*



PURSE-SIZE glass pressure bottles for hair spray are less than three inches tall. They can be refilled in three seconds by inverting on a large-size aerosol container of the same product. Surface decoration and styled valves and overcaps provide individuality for this group. *(Owens-Illinois photo)*

Another lehr coating employs sulfur dioxide, which is introduced in the lehr when container temperature is about 700 deg. F. The sulphur treatment tends to leach sodium from the glass and toughen the outer "skin." This toughness gives excellent protection but does not last well, for the coating is quite soluble. Practically all returnable bottles that must encounter internal or external pressure are given a lehr coating of some type.

The second process for coating applies the coating, usually by means of a spray, after the container has left the lehr. One type of coating used in this process is a silicone solution. It is easy to apply and has many desirable properties, but it has some disadvantages including the fact that special types of label adhesives are required because of silicone's anti-adherent properties. A semi-permanent, wax-type coating has been developed and, reportedly, it does not interfere with label adhesion.

A table on page 354 lists six major types of coatings and rates their performance according to their desirable characteristics.[1]

Decoration and design

Another basic for packagers to consider is the fact that glass containers excel in the variety and quality of decoration that can be exploited. First of all, glass can be sparkling clear, tinted or opaque in solid colors. Also a wide variety of shapes and forms can be combined with color to give a variety of effects ranging from utilitarian to fine art. The principal surface treatment is applied color, which is fired on and fused to the glass to provide permanent decoration. (See article on glass-container decoration, p. 363.) Applied-color marking is basically a screen process, but can also be applied by decal. In modern glass container factories, applied color is screened on automatically and at relatively high speed. The cost of this labeling is inexpensive—it can be as little as one cent per container. It is especially recommended for multi-trip



PRIVATE-DESIGN bottles for new all-purpose detergent have "pinch waist" for easy gripping and dispensing, wraparound labels. Metal screw-caps are lithographed. *(Anchor Hocking Glass photo)*

1 Also see "Surface Treatment of Glass," MODERN PACKAGING, Sept., 1961, p.146.



NEW 1¾-oz. glass container used for Williams shave lotion. Special offer to promote the new size is featured on folding-box container. *(Brockway Glass photo)*

PRESSED-GLASS tumblers containing sour cream are attractive for re-use, with motifs tying in with other Foremost items. *(Photo, Hazel-Atlas Div., Continental Can)*



bottles and for drug and cosmetic containers where permanence or appearance is a major label requirement.

Semi-permanent or single-trip marking or labeling is available in several types including equipment and methods developed for use on the packaging line.

Deciding shape and style of a glass container is a matter that only experts in design, glassmaking and packaging should tackle. There are certain elements, however, that anyone using glass should keep in mind. The simple, uncomplicated, cylindrical styles are the most economical and most practical where strength and handling are concerned. They use less material, and sharp angles and corners inviting impact are avoided. The article discussing labeling equipment p. 452, for example, illustrates some of the problems that arise with compound curves, sharp corners, recessed panels and the like. The strongest, lightest and most economical container results when a cylindrical shape is selected and when the height is carefully chosen in proper ratio to diameter. The table on page 354 shows how the geometric shape is related to the amount of material required to provide a container of given capacity. The sphere is most economical of material. Next is the cylinder whose height is equal to its diameter.

Industry facts

The glass container industry categorizes its shipments in four main groups according to end use: containers for (1) food, (2) beverages, (3) drugs and cosmetics, and (4) household and chemical products. There are some 42 companies, operating 90 plants throughout the country, with greatest concentration in the East. In 1960, the industry dollar volume totaled $908 million for containers, $277 million for closures.

Food containers totaled above 9 billion units, or 41.3%, of the total domestic shipments. Beverage containers numbered more than 6 billion, or 27.7%. Drug and cosmetic containers were above the five billion total, for 22.5%. Containers for household and industrial chemicals totaled nearly 1.9 billion units in 1960 and this was 8.5% of the total domestic shipments. For the past five years, shipments have set new records.

Manufacture. Glass is made in many different formulations and can be varied by the type of sand or silica as well as other ingredients. For example, a high alumina formula may be specified for certain liquor containers to provide a glass that is harder and more durable. The common type of glass is soda lime or flint glass. The *U. S. Pharmacopoeia* categorizes glass by means of four tests. Glass passing the Type I test, usually borosilicate, is highly resistant. Glass passing the Type II test is fairly resistant and is usually treated soda lime. Type II glass can be sterilized before filling. Glass passing the Type III test is regular soda lime of good quality. Glass passing the Type IV test is fairly resistant glass, usually treated soda lime, but differs from Type II in that containers of this type can be sterilized after they have been filled with product. The Type IV test is more rigid and demands higher chemical durability than is a requirement of the Type II test.

Special types include amber, green, blue and opal glass plus a wide range of containers which are tinted, have integral color pigments incorporated in the glass or employ special surface treatments such as frosting, etching, spraying or application of inks. Such surface treatments are produced by a variety of methods.

There are four basic processes used in producing glass: blowing, drawing, pressing and casting. *Blowing* uses compressed air to form molten glass in the cavity of a metal mold, like blowing up a balloon. Most commercial bottles and jars are produced on automatic equipment by this method. A few hand-blown bottles are used in packaging fine cosmetics, etc.

In *drawing*, molten glass may be pulled through dies or rollers that shape the soft glass. Speed of draw and temperature control size and shape of the section drawn. Rods, tubes, sheet glass and other items of uniform cross section are generally produced commercially by the drawing method.

In *pressing*, mechanical force (a plunger) is used to press the molten glass against the side of a mold. *Casting* uses gravity or centrifugal force to cause a gob of molten glass to form in the cavity of a mold. Combinations of these methods can be employed to achieve different end results.

Basic types of containers

The basic types of glass containers are bottles, jars, tumblers, jugs, vials, ampoules and carboys. There also are special types including cartridges and pipettes. The latter are small tubes that contain only a drop or two of product. Size capacities range from drams, drops and ounces (especially for drugs and cosmetics), through pints, quarts and gallons (for foods and other products) and up to 13 gallons in carboys (especially for industrial chemicals).

Bottles are, by far and away, the most extensively used type of glass container. Shapes are cylindrical, oval, flask, oblong, rectangular. The neck is always round and usually it is considerably smaller than the body of the container. The neck, which may be long, stubby or in between, makes for pouring ease and lends itself to effective closure. When the neck opening of the bottle is held to a practical minimum this promotes economy in the amount of materials required for closures—and, as a general rule, glass is a less expensive material than the metal or plastics used in producing the closures.

The portion of a bottle which contains the opening and accommodates

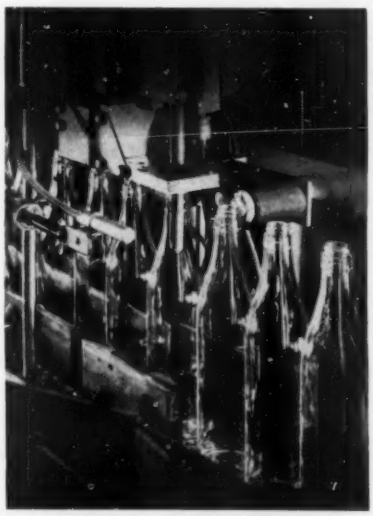
the closure is the *finish*, for, prior to automatic blowing, the mouth of the bottle was the last part to be finished. The word *finish* is now a standard term in the glass container field. The principal types are thread, lug and friction; and two major categories are narrow neck and wide mouth. Special types of finishes include sprinkler tops, roll-on, biological, pour-out and snap-cap. Glass finishes, in the interests of economy and efficiency, have long since been standardized so that a packager can procure bottles and closures from any number of different sources and simply specify the standard finish to be sure that bottles and closures will fit. The standard finishes are designated by number—for example GCMI Finish 400, which is a shallow continuous thread—and the standards are all on file with the Glass Container Manufacturers Institute (GCMI), the industry trade association, which headquarters in New York City. Glass finish sizes are designated by millimeters of outer diameter of the bottle or interior diameter of the closure. There are GCMI recommended designs for bottles as well as finishes. Two of the better known types of bottles are Boston Rounds (a simple cylindrical shape with rounded shoulders and familiar because of its use for peroxide, mouth wash and similar liquid products), and Blake prescription containers which are oblong-style stock containers with rounded shoulders, usually amber colored with a wide-mouth finish and used for pills and powders.

Jars are quite similar to wide-mouth bottles, and certain types tend to overlap in construction and in use. Their shape gives them certain important functional characteristics. The large opening lends itself to the filling of whole fruits, pickles and the like. Also, the opening accommodates spoons, large utensils or fingers. Jars thus are convenient for powdered foods like soluble coffee, powdered milk, face cream and medicinal ointments. Jars usually have a low center of gravity and lend themselves to easy handling and display; also they function well in the kitchen or dining room, on the dressing table or in the medicine cabinet. Some types of cosmetic jars are so strong that breakage will result only when they are subjected to excessive abuse.

Tumblers are closely related to jars, except that they have no neck. Their characteristic shape is that of a drinking glass. A typical use is for jellies, preserves and other spreads. Their value for re-use makes them a perennial favorite for special promotions.

Jugs are large-sized bottles typically equipped with a short, small neck and a carrying handle. The most common capacities are gallon and half-gallon sizes. Jugs are used extensively in institutional and industrial packaging, but also are important for household products. In view of the advantages previously cited for king-size packaging, additional consideration of the jug would appear warranted.

Vials are small glass containers, generally less than an inch in diameter and several times the diameter in height. Vials are flat-bottomed and are tubular in shape and have a tapered neck. Originally, vials were produced from glass tubing, but today are also blow-molded on automatic machinery. They are widely used for serums, antibiotics and other pharmaceuticals. Frequently, autoclaving is involved and glass that withstands sterilization is specified. Plastic stoppers or other special types including tamperproof, rubber-and-aluminum closures are employed. Because of the considerable amount of progress made by the producers of drugs and pharmaceuticals in recent years, packaging in vials has reached a high level of achievement in regard to both speed and flexibility. Line speeds from 200 to 300 vials a minute are attained by a number of companies.



AUTOMATIC inspection device to assure quality of glass bottles is an electronically controlled plug gauge. If the carefully calibrated plug encounters resistance on entering bottle neck, a mark is stamped automatically on the bottle to alert inspector. *(Ball Bros. photo)*

Ampoules are a highly specialized type of container made from glass tubing. The bottom of the ampoule may be flat, rounded or convex. The opposite end is drawn out to a point. After the product is filled into the ampoule, the open end is melted in a flame and sealed shut. The most positive kind of protection and control results and the ampoule must be broken at a designated break line before the contents can be used. Typical uses are for serums, injectables and similar professionally administered products.

Carboys are heavy-duty shipping containers that combine a 3-gal. to 13-gal. capacity glass bottle with a wooden overpack. Their important characteristics are chemical inertness, strength and extremely long use-life.

Glass for foods

A primary consideration in selecting a glass container for any food product is to what extent the container will help sell the product and keep the customer coming back for more. A good many considerations—protection, convenience and economy—are involved in how well a package sells, but in today's marketing it is imperative that the packager consider the total selling effect as well as the separate elements of his product's packaging requirements.

The charge has been made that too often the packager is so concerned with selecting his package and filling it efficiently that he fails to look outside these areas to see what his customers really want and just what opportunities his competitors have left untouched.

As outlined in the introductory section of this article, glass containers offer a combination of advantages. Among the factors that should be carefully studied where glass-packed foods are concerned are the following: (1) People like glass. (2) Glass-packed foods are associated with extra quality because flavor and goodness are so well preserved, because the attractiveness of the food can be seen and because packers tend to put their best grades in glass. (3) Glass is convenient to use and it is an attractive container. (4) It usually permits an option for re-use or discard. (5) Consumers may not think of glass as

an economical container because of its weight, its nice appearance and frequent use for luxury foods. On the other hand, they commonly see it in use for lower cost foods and beverages and unconsciously or not must give it a fairly good budget rating.

The foregoing is but another way of saying that glass starts out with many natural advantages where food packaging is concerned. In modern terminology, glass containers have a good corporate or package image and the motivation quotient is high.

Another factor for the food packager to consider is the premium that must be placed on impulse purchasing and the speed-up in turnover of products and in the traffic of shoppers through the store. In this connection, the visibility factor of glass has probably been given insufficient consideration. Glass containers make for very rapid selection and purchase of products. One has only to observe the activity in front of the baby-food displays to prove the accuracy of this statement.

New applications

An important consideration in the use of glass for food products is the amazing versatility that can be brought to bear in giving glass new and exciting jobs to do in the merchandising of a product. In recent years entire product lines have been given a boost with glass. Examples are applesauce, seasonings, sauerkraut, mushrooms, onions, yogurt and synthetic sweeteners. Applesauce, for example, has made very satisfactory gains. The package used by a leading marketer of this product is an excellent example of how "personality" can be achieved while the simplicity and economy of a stock style are retained. The spices that are employing glass to such good advantage capitalize on the asset of easy closure and reclosure plus the convenience of dispensing fitments and of visible inventory of the quantity on hand, which helps avoid waste. Products such as onions and mushrooms in glass team up a basic advantage, inertness, with an impulse factor, visibility. A third element, appropriateness, is sometimes used to good advantage, and containers such as the penny-candy jars, or baked-bean jars that suggest nostalgic recollections of flavor and old-time goodness, can be extremely effective.

Containers that are more functional from the point of view of both the merchandiser and the user are turning up with increasing frequency. In stores you will see numerous jars for jams and pickles so designed that the label on the container "looks up" at the customer. You will see square jars that use less shelf space and give full label readability from an angle. You will see shelfless displays where attractive glass containers, stacked in their effectively printed–top-removed –shipping cartons, are intercepting store traffic at strategic locations and at the same time requiring a minimum amount of work in the areas of stocking and handling.

Glass for beverages

Glass and beverages go together naturally. The reasons are inertness of glass, the complete and long-lasting protection that bottles afford, design versatility and tradition. As a result, virtually all wines and liquors, 98% of all soft drinks and 64.3% of packaged beer are merchandised in glass.

Tradition and custom always have played a large part in the use of glass for beverages and will continue to do so.

Liquor bottles, for example, have tended toward slender, round shapes with tall labels to make the package look large and to make it easy to handle. The new lightweight beer container, on the other hand, is quite streamlined in the interests of lighter weight, easier handling and lower costs. These factors are of special merit in the case of beer because of its competitive struggle with cans for the beer market.

From the standpoint of design versatility, glass offers advantages that are difficult, if not impossible, to duplicate. You can have practically any size ranging from 1-3/5-oz. miniatures up to gallons.

Bottles for soft drinks are taking advantage of the fact that you can get a variety of sizes. Bottles are thus able to serve and reach their total markets better. Ceramic color labeling is being viewed with new interest by certain beverage bottlers. Of course a major factor in this field is the economy of the returnable bottle. This does occasion extra effort for the consumer and for the retailer, but the advantages for the consumer in terms of taste and economy and for the retailer in terms of bringing customers back to the store are of considerable importance.

Glass for drugs

Glass containers are a practical and often a specific necessity for meeting the complex packaging requirements of the drug industry. The products of the industry are divided into two classifications–liquids and drys. Official standards for the identity, strength, quality and purity, preparation, protection and packaging of substances for medical use are outlined in the *United States Pharmacopoeia* and enforced under the Federal Food, Drug & Cosmetic Act.

Glass containers for drug use are generally available in clear flint or amber color. Blue, emerald green and opal glass colors may be obtained from a limited number of sources. However, blue, green and flint glasses transmit ultraviolet and violet light on wave lengths of about 3,200 to 4,000 angstrom units and do not meet the U.S.P. specifications for light-resistant containers having complete protection against ultraviolet, violet, and violet-blue (2,900-4,500 angstrom). Amber is usually used for drugs that have extreme sensitivity in this range. Most glass, including flint, gives some protection in the far ultraviolet units (2,900-3,200 angstrom units) and emerald-green gives some protection in the visible violet-blue range (4,000-4,500 angstrom spectrum).

Generally speaking, the packager will find it advantageous to use a minimum number of sizes of glass containers to market his product. The fewer the sizes used, the simpler becomes the inventory and stocking problem of the manufacturer, the wholesaler and the retailer.

Similar advantages are to be gained from keeping closure sizes at a minimum. Limiting the number of closure sizes achieves production savings through less-frequent production-line change-over in filling and capping.

The packer must determine his need for either stock-mold or private-mold glass containers to meet his merchandising objectives. Frequently, stock-mold containers will be entirely satisfactory, but, where a special functional characteristic or brand identity is desired, private-design containers are desirable. The cost of molds for private-design glass

Du Pont answers your questions

about one of today's most versatile packaging tools for glass-packaged products

Question: **What are Du Pont "Cel-O-Seal" cellulose bands?**

Answer: "Cel-O-Seal" cellulose bands are decorative and protective neck-band seals which may be used as a secondary closure or label—or both—on glass packages. Applied wet (by hand or machine) to the bottle neck, they shrink dry to form a snug-fitting, eye-catching seal. Transparent or opaque, they can be printed in a variety of designs and colors.

Question: **How can "Cel-O-Seal" bands help my company's packaging program?**

Answer: Custom-designed "Cel-O-Seal" bands can turn the bottle neck into a distinctive identifying feature. They add labeling space, provide protection. Brand names, messages, symbols, uses, promotions, "sealed-for-safety" assurance can be highlighted on every package . . . without waste of shelf space, without major packaging changes.

Question: **Do "Cel-O-Seal" bands influence sales?**

Answer: Market tests indicate they do. In these tests, for example, selected glass-packaged products topped off with "Cel-O-Seal" bands outsold unbranded containers of the same products—*for every product tested.* Average sales increase was 17.9%! Such results are a strong indication of the new sales appeal, the merchandising opportunities offered by distinctively personalized "Cel-O-Seal" bands.

Question: **What is the first step I should take to see if "Cel-O-Seal" bands will help answer our packaging needs?**

Answer: To see how you can *profit from the bottle neck*, fill in and return the coupon below. Complete information on the use of "Cel-O-Seal" bands will be forwarded to you. If you wish, send in a labeled container. Our packaging specialists will band it, make recommendations, return it to you. No charge, no obligation. We will work with you to determine how "Cel-O-Seal" bands can most effectively meet *your* packaging needs.

E. I. du Pont de Nemours & Co. (Inc.), Buffalo 7, N. Y. "Cel-O-Seal" cellulose bands are also sold by Armstrong Cork Co., Lancaster, Pa.

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"Cel-O-Seal" Bands, (MP) Buffalo 7, New York

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☐ We are sending a labeled container. ☐ Have your representative contact us.

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containers ranges from $3,000 to $5,000, depending on the size, shape and amount of surface decoration and the type of glass-fabricating machine on which the mold equipment is to work.

Shape of the glass container is important. Round bottles are priced lower than oval, oblong or square bottles. Rounds are strongest in resistance to internal pressure and external impact and straight-sided round bottles lend themselves to the highest-speed labeling.

Oblong and square bottles are frequently termed "space savers," because they require less shelf space than rounds. Broad label area on oblongs provides excellent shelf visibility and some oblong bottles are designed for labeling on the edges for supplementary identification either on the dealer's shelf or when placed edgewise in home medicine cabinets.

The shape of the shoulder, neck and bottle finish should be funnel-like to achieve good pouring characteristics. Sometimes a special finish with an undercut lip is used to facilitate pouring and cut-off of the liquid.

In purchasing solution bottles for parenteral products, private-mold containers are usually required. The glass manufacturers are usually required to sulphur treat the bottles to reduce alkaline solubility. Great care should be exercised in the fit of the closure and in the length of the glass air-vent tubing found in this type of bottle.

Packagers of citrate of magnesia may purchase stock citrate bottles or may package the product in low-cost, nonreturnable bottles.

Packagers of products which are dispensed from dropper bottles must determine whether or not the rubber-bulbed dropper assembly can be safely used as a primary seal.

In packing dry products, such as tablets and capsules, careful consideration should be given to the use of cotton, plastic or paper-folder stuffing as a means of protecting the contents. Also, within broad limits, the manufacturer may employ the use of cotton stuffing at the top of the container of capsules or tablets to minimize the number of container sizes required and thus gain the advantage of minimum price and inventory space saving by larger purchases of fewer sizes.

Careful analysis of the size of closures should be made to determine the minimum size required for the maximum filling speed. Sometimes the economy of a small-size closure is more than offset by the cost of reduced filling speed.

Careful consideration should be given to the shoulder design of wide-mouth containers to facilitate delivery of the contents in the case of powders, tablets or capsules.

Shape of wide-mouth bottles and jars should be analyzed in relation to cost and label-space requirements.

Packagers of ointments must regulate the height of glass jars in relation to ease of extraction of the product with the fingers.

Glass for cosmetics

Since products of the cosmetic industry are concerned chiefly with the ingredients of "beauty" and of catering to the dictates of good grooming, the versatility of design and decoration provided by glass is highly important. Glass containers may be manufactured in a multiplicity of shapes, designs and contours. These design characteristics may be utilized to enhance the display of the product and offer consumers much greater convenience.

The cosmetic packager must first determine the desirability of using open-stock molds or developing private-design molds for packaging his products. Open-stock, glass-container molds are available in a wide range of sizes and shapes, suitable for introducing and market testing new items for packaging products of limited volume or where the cost of the container is a critical factor.

When large volume is established and major advertising promotions are involved, it is usually desirable to develop private-design containers to assist product and brand identity.

On mass-market cosmetics, such as shampoos, shave lotions and hand creams, the packager must carefully analyze his need for high-speed filling-line performance in relation to his desire for unusual container shapes.

Modification of container contours and shapes may be necessary to secure uniform glass wall distribution and basic stability for successful operation on a high-speed filling line.

New design trends in glass containers favor modern simplicity of form suitable for high-speed packing lines over designs of unusual shape with

Food, wine, liquor, cosmetics, drugs. It makes sense to give your product the best protection you can find. That kind of protection comes with aluminum caps . . .

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STERICAP

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structural weaknesses. There is a definite design trend toward greater consumer convenience and utility, such as providing nonslip hand grip and more convenient shapes for carrying in traveling kits or storing in the medicine cabinet. The packer should carefully analyze the need for consumer-convenience features which can be successfully promoted with substantial advertising campaigns.

The chemical inertness of glass containers has also opened up new possibilities for low-pressure glass aerosol containers for spray dispensing of such products as colognes, anti-perspirants and hair preparations. Glass aerosol containers are manufactured and sold both with and without plastic coatings.

Household and chemical products

Packaging progress in this field has been exceptionally strong. The increase in the number of homes, the move to suburbia and the do-it-yourself trend have stimulated a vast increase in products for the home, lawn and garden and for hobbies and recreation. Moreover, there is a premium placed on work-saver products and packages because the modern home is run without benefit of servants and everyone has heavier demands on his leisure time.

The effect of all this is to create opportunities for the packager. Naturally, glass containers are important in this field because so many of these convenience, work-saver products—cleansers, liquid starch, deodorants, insect sprays and the like—require the protective properties of glass. Also, glass offers easy closure and reclosure and functional dispensing.

Effective, strategic merchandising use of glass for household and chemical products starts with consideration of the basic advantages of glass as outlined previously. There are many modern examples of ways glass is being used to boost sales.

Glass containers lend themselves to the type of display and handling that household products require. Of considerable importance for products in this category is the fact that visible packaging produces impulse sales, increases turnover and also helps promote the many new products which require plus elements in regard to identification and self-selling.

Effective decoration of glass

by Anthony Velonis*

The term "applied-color labeling, or ACL," employed by the glass industry to designate fired-on ceramic color printed by the screen process, now appears somewhat limiting in the light of current uses of this method. Since much more than simple "labeling" is involved, "glass decorating" seems more appropriate and inclusive.

The significant change is the designer's increased use of the process to glamorize and upgrade packages by taking advantage of the intrinsic jewel-like quality of colored glazes and precious metals. With proper design, elegance can be achieved.

Refinements in techniques and materials provide a decorative medium difficult to duplicate in permanence, color and effect. A good range of colors has been available for years. Now additional refinements in color effects have been achieved. A transparent flux or crystal frit is used with certain clear colors to create remarkable glass-staining effects.

Another striking technique is contrasting matte and glossy ceramic glazes both for their own sake and as grounds for gold. This gains, at the same time and at the same cost, a multiplicity of surface effects by only three applications—for instance: (1) glossy color (either opaque or transparent); (2) matte, satin finish (fully opaque or translucent); (3) gold fired on glass for a high mirror finish; (4) gold fired on glass for a reflective finish but with a raised or sculptured look; (5) gold on matte color for a coin-gold or encrusted look.

Many varieties of such effects are now available at reasonable cost. The richest-looking and most unusual product often results from close collaboration of designer and glass decorator.

Precious metals now are applied on glass, in increasing quantities. Platinum and palladium are not as common as gold. The precious metal is supplied in a resinous paste containing oils, solvents, etc. This is screened and then fired. The heat drives out the nonmetallic components leaving a very thin film of the metal itself.

Colored lustres which fire in the same manner as gold are now available. The color seems to be part of the glass and the surface has a slight iridescent effect. More pronounced iridescent effects are also obtainable in spray mediums.

Briefly, the screen process starts with an open mesh material stretched tightly on a wooden or metal frame. The mesh is impregnated with a photosensitive emulsion, exposed and developed in a manner paralleling photoengraving, except that there is no plate to etch. Instead, resulting film becomes a stencil; it is firmly adhered to or impregnated in the mesh.

The method has been called "silk-screen printing" but now is more often referred to as "screen stencil printing" since other materials, such as stainless-steel mesh and monofilament nylon mesh, are fast supplanting the older natural-fibre silk.

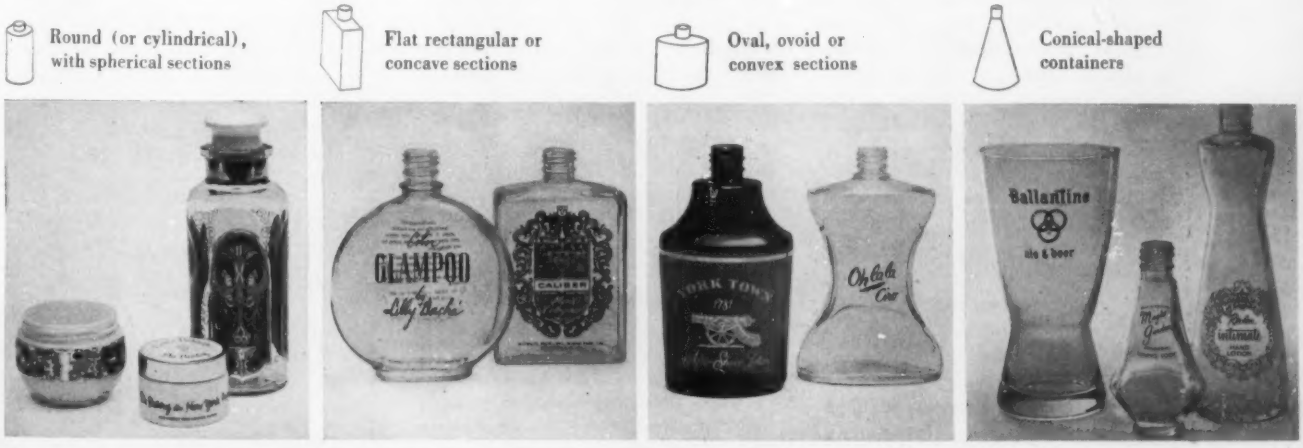
The stencil screens are clamped to a machine, usually semi-automatic, which moves the screen in a straight-line stroke across the container which is being turned and printed. Directly over the axis of the bottle is a wedge-shaped rubber squeegee which forces "glass" paint through the open areas.

This "glass" paint is a vitrifiable pigmented mixture containing oils or waxes which act as temporary vehicles. The organic materials burn off in a continuous furnace or "lehr" at a temperature below 900 deg. F. As the temperature rises, the remaining inorganic powder coalesces, or "matures," at from 1,000 to 1,150 deg. F. (depending on the materials) into a glossy, impervious color, permanently fused to the glass.

Continuous mesh-belt furnaces average about 100 ft. in length. The firing cycle or time for the glass container to pass through the lehr may be from 1½ to 3 hours. The variation depends chiefly on the glass and its wall thickness, since re-annealing is necessary to maintain strength.

Advances in handling and production have kept glass decorating prices from rising with other costs. Custom printers, who once specialized in short runs, find they can offer greater economies in runs of more than 10,000 pieces. Advances in printing technique have increased legibility and accuracy and contributed substantially to general attractiveness.

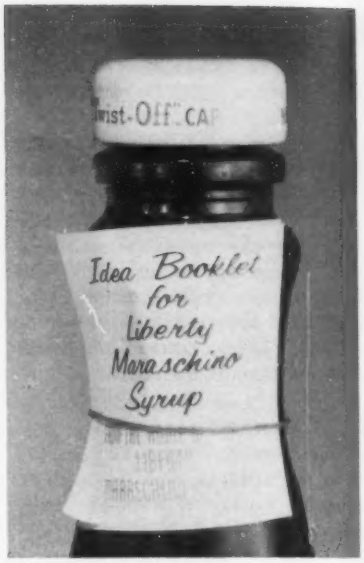
* Technical Director, Ceragraphic, Inc., Hackensack, N.J.



Four groups of bottles, suitable for high-production decorating, are shown here with outlined indications of the basic shape of each group.



TAMPERPROOF feature is added to this cap by coding device. Three parallel bars, printed by coder, break as cap turns—evidence that cap has been opened. (*Alcoa photo*)



RESEALABILITY of twist-off cap fills consumer need. (*White Cap Co. cap*)

Closures for bottles, cans, jars

Closures for glass and other rigid containers are constantly being designed for easy yet safe opening and closing. An era of new satisfaction is already at hand for the homemaker, with several modern styles of easy, re-seal vacuum closures and improved pry-off lids now supplementing the many styles that have been developed by manufacturers over the years.

Improvements in closure appearance have made steady progress along with improvements in efficiency. And some of the most important gains that lie ahead for packagers and consumers also involve easy dispensing devices and fitments. (See article on dispensers and applicators, p. 377.)

The problem of container closure demands the satisfaction of two opposite conditions: (1) the seal must be so positive that the contents cannot escape and no outside substances can enter the container; (2) the user must be able to break the seal easily and often to reclose the container a number of times during product use if necessary.

The many solutions to this problem which have been devised in modern times for low-cost, mass-production containers are remarkable, considering the variety of products packed in glass, metal, plastic, etc.

Most closures now are made of metal or plastic, though cork, paper and rubber have important uses in this application.

Almost all closures in wide use today achieve a seal by acting as one of the jaws of a vise, the other jaw being the container top, called the sealing surface. Between these jaws a resilient material of some kind is squeezed, actually providing the sealing surface under pressure. This is the liner of the closure. (See article on closure liners and seals, p. 369.)

The principal types of closures[1] are (1) screw cap, (2) lug cap, (3) rolled-on, (4) crown, (5) snap-fit and press-on, (6) vacuum, (7) tamperproof or safety, (8) dispenser-applicator closures and (9) an important group of paper, cork and rubber closures that have special applications for dairy products, wines, pharmaceuticals, etc. In addition, there are several kinds of secondary or supplementary seals and closures, such as plastic shrink-on bands, used with standard caps.

Certain types and styles of closures are traditional for various containers or products, while others are selected for ease of handling on the filling line (see article on capping and sealing equipment, p. 448), consumer convenience in opening and reclosing, economy or decorative appearance.

The wide variety of closures in current use indicates that the packager can emphasize any of these requirements and still be assured of a closure that will fulfill its primary objective, which is, of course, protection of the product.

Screw cap. The most important idea to emerge from early developments in metal closures was the screw cap, still a leader and supplied in various metals and plastics. The threads of the screw cap engage with corresponding threads molded on the neck of the container. This style has survived because of the basic soundness of its principle, which offers a mechanically simple means of generating enough force to provide safe sealing as well as easy opening and resealing.

All kinds of liquids, viscous products and creams or pastes that can be packaged in bottles or jars are seen using this type of closure, particularly

[1] Closures and applicators for collapsible tubes are discussed on p. 335.

foods and household or industrial preparations that are packaged in put-ups of quart size or less.

Lug cap. Near relative of the screw cap is the lug cap, which operates on much the same idea. The lug is slid under a projection on the neck of the container. As it is forced home, it obtains leverage for a direct downward pull against the liner.

Lug caps are suitable for use on most products that are packaged in glass containers. The container finish is designed to accommodate the lug construction. Lug-type screw-off metal vacuum caps have been adopted by leading packers. Equipment has been developed to make it practical to apply these caps at high speed. The caps excel in ease of opening and reclosing.

Roll-on cap. The rolled-on closure (a patented device) differs from screw or lug styles in that it is supplied to the packer as a blank shell, usually of aluminum. The shells are rolled against the threads of the container neck under pressure in the closure operation. The threads of the individual container tailor the thread of the particular closure to a perfect fit or more effective seal.

A number of variations have been devised for the metal cap to conceal the outline of the thread or lug so that the outer surfaces of the closure will present clean, unbroken lines.

Crown cap. Another important type of closure is the anchored closure, such as the familiar crown cap for bottles. Flutes are pressed into the flaring skirts of a shallow metal disk, which holds an inner coin of resilient lining material that forms the actual seal. In capping, the flutes are forced against a projecting ring on the container finish, giving maximum friction for the strong grip needed in sealing carbonated beverages, where pressure inside the bottle is considerable. Yet the crown cap may be removed by a simple prying motion because of the inherent outward flexibility of the flared cap skirt and the smoothness of the ring on the bottle neck.

Lock-type crown. Where frequent resealing is required of a crown closure, a spring lever is sometimes incorporated which, when flipped up, releases the crown in perfect shape for efficient reclosing. It finds excellent use on cans of turpentine, oil, varnish, syrup and similar products, and also, though to a lesser degree, on bottles.

Snap-fit or press-on cap. Some very effective closures are in reality little more than metal lids with some simple method of hooking to the glass finish, like a ring of indented beads along the side or a continuous indentation which snaps under certain portions of the glass finish. In other cases, only the friction between the inside of the cap skirt and the outside of the container finish holds the cap in place. Friction snap-ons come in polyethylene as well as metal and are used on glass, plastic or metal containers like toothpowder cans.

Slip-on or snap-on caps are frequently found on re-use tumblers,



DEEP LUG cap with cut-rubber ring vacuum seals all types of liquid, viscous, oily products. (*Crown Cork & Seal photo*)



VERSATILITY in application is achieved by roll-on aluminum cap. It molds to thread pattern for tight fit. (*Alcoa photo*)



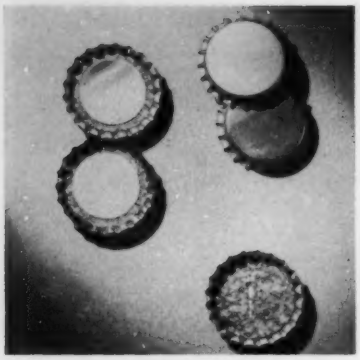
VACUUM caps—long favored for protective quality and high application speeds—now reclose more easily to facilitate customer use. (*Owens-Illinois cap*)



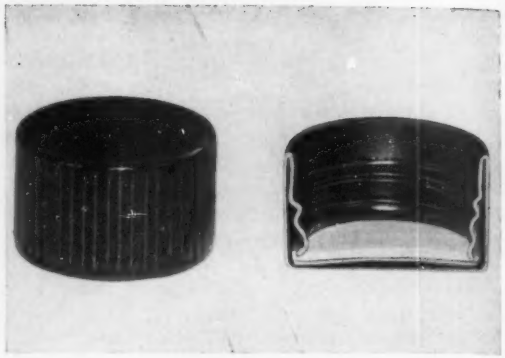
SECONDARY closure of glassine acts as moisture barrier, preserves flavor of powdered products. Two sheets are wax-laminated. (*Anchor Hocking Glass seal*)



TIGHT protective seal combined with easy opening and reclosing explains why the twist-off cap has come into popular use. (*White Cap Co. photo*)



MOLD-FREE cork disk, bottom, bonded with zein, is used for soft drinks. Reduces need for "spots." (*Crown Cork & Seal photo*)



TURNED-UNDER, double-wall aluminum closure hides preformed threads; cap gains appearance of molded plastic. (*Alcoa photo*)

where the even finish of the glass rim is part of its attractiveness. Jellies and nuts are sometimes packaged with the use of this particular type of closure.

Vacuum cap. The non-screw vacuum cap has made important strides volume-wise during recent years. Sealing leverage develops from atmospheric pressure obtained against the package when air is withdrawn from the containers by the sealing method, steam or mechanical means. This type of closure is ideally adapted to the needs of the food-processing and packing industry.

Sometimes further security for this type of seal is given by holding the cap to the finish with a fixed lock, the edge of the cap being forced under a projection of the glass finish during capping or held under a similar projection by snap lugs. In many vacuum caps, however, the friction of a rubber gasket against the side or top of the container finish effects the seal. In others, atmospheric pressure alone is adequate for sealing.

In addition to the protection given perishable products, vacuum closures are popular because of their extremely high application speeds in straight-line capping operations. The capping motion required is a straight thrust rather than the more time-consuming twist required in screw- or lug-capping operations.

The resealing disadvantages which plagued the early vacuum caps have been largely overcome by better designs and greater consumer experience in opening and reclosing them as the maker intended.

Safety closures. There are several different types of safety closures designed to guard against tampering. In one type, both container finish and cap skirt are extra deep. The bottom of the outer cap shell is curled under a protruding ledge on the neck finish, giving a tight grip which resists any attempt to unscrew it without tearing along a break line perforated in the cap above the skirt rim. When twisted, the cap comes off, leaving a portion of its skirt on the bottle. The cap is generally threaded so that it can be used for resealing.

Another closure has a special metal collar. Once the collar is opened, it cannot be reclosed. The cap can be put back on, but the metal band left on the bottle shows that part of the original closure is missing.

Single-piece metal safety closures are made like a shallow roll-on cap but with an opening cut into the center of the dome. When pulled, the cap comes off easily except that it tears. An inner closure, often a cork plug, thereafter serves to protect the remainder of the contents.

Safety closures are found on bottled liquor, food products, drugs and various chemicals.

Similar protection and smart packaging appearance are provided by several types of supplementary closures available. One type is the paper disk or diaphragm that is sealed over the neck opening of the bottle to help protect the contents. It is popularly used on containers for food and pharmaceutical products.

Another type of secondary seal is the outer foil wrap, frequently employed on beverage bottles. The shrink-on band is another secondary seal whose use is steadily increasing for purposes of both protection and decoration.

Plastic closures

Plastic closures generally fall into two categories based on the materials from which they are made – thermosetting and thermoplastic resins. Principal thermosetting resins are phenol formaldehyde and urea formaldehyde, which have many characteristics in common. They offer a finished part which is light in weight and resistant to alcohol and which has good surface appearance. Leading thermoplastics which are used for closures include polyethylene, vinyl and polystyrene.



PRESSURE-FORMED vinyl milk-bottle cap with 38-mm. finish has flexibility for good seal. (*Sealright cap, Bakelite vinyl*)

The choices of liner materials will depend on the specific products which are being packaged. (See article on closure liners and seals, p. 369.) Generally, however, the liner backing is made of cork, wood pulp or newsboard bonded to a facing of film, paper or foil. Closures made of polyethylene do not, as a rule, require the use of a liner.

The thermosetting compounds can be molded into standard shapes for standard containers—chiefly, glass bottles packaging all kinds of liquids, whether food products, medicines,

household preparations or toiletries, and opal glass or plastic jars packaging salves, ointments and creams in the drug and cosmetic lines. These closures are almost entirely of the deep- or shallow-skirted screw-cap types and are used instead of metal closures where unusual decorative effects are required.

Special effects, in both shape and color, can be gained by private-mold or special-order manufacture. Caps designed to simulate flames, flowers, plumes, boots and hats, as well as abstract shapes, are made to order for special package treatments.

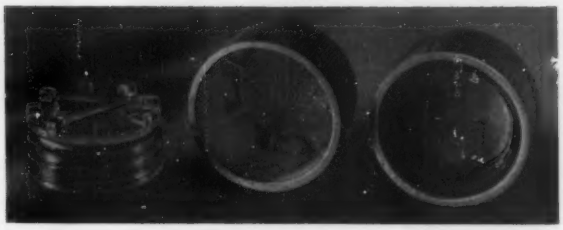
Plastic caps can be plated for metallic effects. One such recent development, a plastic compound, has an inherent sparkle created by the composition of the material itself. The effect is quite eye catching.

Many types of dispenser-applicator closures service various specialty markets. There are special dispensing closures for seasoning salts and powders, with a whole line of combination closures and droppers or stopper rods for such products as nose drops and iodine.

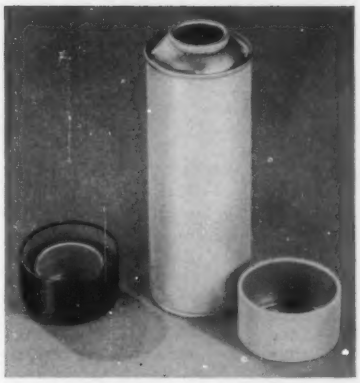
Polyethylene, because of its many advantageous properties, is one of the most versatile materials for re-use, dispenser and other specialty-type closures. Judging from advances already made, the field is practically unlimited. Screw, snap-on and plug caps are the popular types, but there are many variations, including captive or hinged-on caps and novelty designs. In addition, special spout and nozzle constructions can be found in both the consumer and the industrial fields.

The polyethylene snap-on caps lend themselves especially well to application on jars, tumblers, refrigerator dishes and juice shakers, where their re-use value adds greatly to their appeal. For this reason, polyethylene closures are a natural for certain food packages. On the other hand, they are equally efficient as closures for pharmaceutical packages and are, for example, widely used on vials. Polyethylene closures are also strong in appeal where novelty or attractiveness may be desired, which accounts for their popularity on packages especially designed for toiletries, gifts and the like.

Industrial applications are important, too. Jumbo-size polyethylene threaded caps are available in a range of sizes for use on the larger polyethylene bottles. Reversible spout-type closures are being used for added consumer convenience on drums, pails and carboys.



CHILDPROOF closure, used for aspirin, conceals spring mechanism that requires a downward pressure on top of the outer screw cap to engage threads for removal. (*Brockway Glass photo*)



NEWLY developed nibbed dome for aerosol can permits use of lower-cost single-shell overcap (right) in place of double shell. (*Continental Can photo*)



CLEAN lines of printed, unishell metal jar cap lends high-style note to upgraded shoe polish. (*Sterling Seal cap*)

Other closure materials

Parenteral closures. Closures for bottles, vials or cartridges packaging parenteral (continuously sealed and sterile) products for the drug industry are used in great numbers. The developments in antibiotic therapy and its widespread use have increased demand enormously. There are spe-



OVERCAP for glass aerosols, of high-impact polystyrene, strives for fashion effect with exaggerated height. Reverse flare of slightly concave top also leaves a good surface for price marking. (*Walter Frank Organization cap*)



WIDE-RANGING sizes, shapes, rainbow colors, of thermoplastic closures are employed to add low-cost distinctive touch to cosmetic and pharmaceutical bottles. (*Dow Chemical Co. photo*)



SNAP CAP, thermoformed of oriented polystyrene, carrying copy while providing maximum clarity, helps to increase the sales of many food specialties. (*Dixie Cup Co. closure*)



POLYETHYLENE MOLDED cap with A.S.T. 29-deg. stub thread used on 1-gal. bottles for acids. (*Continental Can photo*)



TAMPERPROOF aluminum closure for bottles assures sterility and it is made available in a variety of sizes—11, 13, 20 and 30 mm. (*Alcoa photo*)

cial problems, however, that are encountered by the manufacturers of these closures.

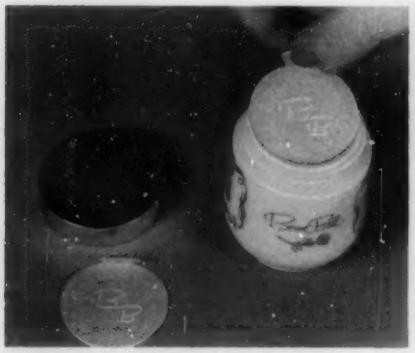
Sometimes they must provide sterility for the product even after the container has been entered several times for withdrawal of single dosages. Closures must in all cases be dimensionally uniform and stable in composition and designed for ease of application to the container on the packaging line.

Migration of particles from the stopper to package contents and leaching of stopper materials by aqueous solutions represent difficulties to be avoided in the interest of product protection and sterility. Treaded rubber compositions are used for closures of this kind, because few materials are able to compete with natural rubber in meeting all of the requirements outlined previously.

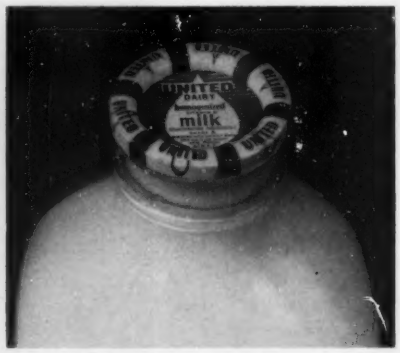
Cork closures have a place in packaging, particularly in glass and ceramics. Often cork is used in combination with some other material. For example, the cork stopper used in the pottery package for an imported mustard paste is sealed into place by sealing wax; the cork stopper appearing on a famous rum bottle is capped by a wooden top faced with an embossed coating that bears the trademark of the distiller. Other cork closures used in perfume and food-extract packaging act as a sort of washer around a glass stopper and supply the degree of resiliency which is needed to effect proper seal of the bottle when the stopper is pressed into place.

Paper closures. A whole industry is serviced with remarkable completeness by waxed and unwaxed paper closures—the dairy industry. Glass milk and cream containers and containers of both glass and liquid-holding paper for various other dairy products like cottage cheese, sour cream and whipped butter are big users of various styles of the paper closure.

In addition to the standard crimp-edge cap which covers the container lip, there are other styles in use such as the flat-disk tab opener which lifts out of the bottle mouth. Sometimes these disks are covered by a pleated outer cover for decorative purposes. In some instances, the outer cover is secured over the bottle lip by the use of a twisted wire.



TAB extension folded back on protective embossed plastic disk for creams and ointments, makes the disk easy to remove even though it lies directly on product. (*Robert Busse photo*)



MERCHANDISING aid is this new milk-bottle cap that can be rim-printed with dairy's brand name and/or trademark for more effective identification. (*Sealright Co. closure*)



CROWN AND CAP are used as a double seal to protect atmosphere-sensitive chemicals and to help maintain their purity. (*Owens-Illinois photo*)

Closure liners and seals

by Tracy Cowen*

Of all the specifications known to the packager and closure supplier there is none more important than the liner specification. Without a liner fitted to the needs of the product and the closure, the entire package may fail at some point between packaging for shipment and use of the product, with resultant loss to the manufacturer in claims and good will.

For the greatest number of uses, the closure liner is supplied as a composite material with the impermeable facing mounted on a resilient backing which acts as a cushion to absorb the sealing pressure and to permit better conformity of the facing to the lip of the container. The backing is composed of pulpboard, newsboard, cork or felt, while the facing is one of the many chemically resistant coated papers, laminated films or metallic foils most suitable for sealing the product in question.

Materials

Varnish-coated papers. This liner facing is produced in very large quantities by applying resistant oleoresinous baking varnishes to pure and bleached kraft paper. It has excellent appearance with high gloss and good flexibility. It has excellent resistance to water, brine solutions, vegetable oils and numerous products requiring a resistant surface of an odorless and tasteless nature. Because of these properties and the relatively low cost of this liner, it has found virtually universal acceptance in the food-packing industry. It is used successfully for packaging such items as peanut butter, olives, cheeses, jellies, maraschino cherries and also all types of pickles, pickled onions, vinegar, mustard, relishes, sauces and other condiments.

With an added wax coating the varnished paper liner with a suitable backing is adequate for packaging such delicate products as mayonnaise and salad dressings which, due to their vegetable-oil content, are subject to oxidation causing rancidity and product spoilage. Varnished paper with the added wax coating, when used in closures for sealing hygroscopic products such as soluble coffee and malted milk, keeps air and moisture out of the package, hence preventing the product from caking or losing its flavor.

Black alkali-resisting paper has been used in the closure trade for many years. It is quite similar to the regular varnished papers with the exception of its color, which is, of course, black. The color is due to the presence of asphalt or gilsonite or both. This liner has good resistance to weak alkaline products like milk of magnesia, hair shampoos, shaving creams, and many other drugs and pharmaceuticals. However, with the development of the newer, more chemically resistant synthetic facings, demand for this facing is diminishing.

Saran-film facing is made by combining 75-gauge clear and pigmented extruded polyvinylidene-chloride film to paper and board with a special adhesive. This facing is the most universally resistant liner material supplied by the closure industry.

This product is not only attractive in appearance but also uniform in color, thickness and flexibility and has little or no odor or taste and no history of pinholes. One of the most remarkable properties of saran-film liner is its resistance to the transmission of water and water vapor. This property evidences itself in actual performance by keeping at a minimum evaporation losses from products sealed with this facing—permitting long shelf life.

The exceptional chemical resistance of saran film to the deteriorating effects of most acids and alkalies, certain essential oils and certain solvents makes it an excellent cap-liner material. Tests indicate it also resists such diversified products as after-shave lotion, alcoholic beverages such as whiskey, wine and gin, face creams, colognes, instant coffee, corn oil, cough syrups, dentifrices, personal deodorants, fruit extracts, mayonnaise, salad dressing, salad oils, salt solutions, hair shampoos, tincture of iodine, vanilla extract and other products. Saran-film cap liner also is a good gas barrier with low permeability to carbon dioxide, nitrogen and oxygen.

Vinyl-coated paper. This product is made on calendering equipment by applying 2 mils of a plasticized mixture of vinyl chloride and vinyl acetate to paper. It has proved a very important contribution to the closure industry. This facing has a very attractive white color with excellent gloss and good flexibility and aging qualities. It is resistant to the following types of products: after-shave lotions, alcoholic liquors, bay rum, bleaching fluid, camphorated oil, solvent cleaner, cuticle remover, eye wash, face creams, glass wax, fruit extracts, hair tonics, household ammonia, writing inks, mineral oil, shoe dressings and silver polish.

Polyethylene-coated paper is made by the same process as calendered vinyl. Up to now, use of calendered polyethylene has been limited to closures for sealing chemicals, pharmaceuticals, and some cosmetics and flavorings. However, its popularity is growing because of its high chemical resistance and low water-vapor transmission rate, good cold flexibility and good aging qualities.

Also, all-polyethylene liners are used—especially for chemicals and similar products. These liners are available as flat disks and one special type is cone-shaped to assure added seal strength and eliminate the problem of back-off. This type of liner can be used with droppers. Assembled liner and dropper is positioned in the bottle opening and is automatically locked in the cap as it is tightened.

Urea-formaldehyde-melamine resin-coated paper. This product has been used successfully in the closure trade for many years. It was developed originally as an inexpensive chemical- and solvent-resistant facing for which it functioned well. However, it really found its place during World War II as a substitute for expensive and scarce metallic foils, vinyl-coated paper and Pliofilm. Demand has continued because of its successful performance on many products during and since that critical period. Urea-formaldehyde-melamine resin-coated papers are resistant to such products as motor oils, automobile polishes, shoe polish, paints, varnishes, indus-

* General Sales Manager, Closure Liner Div., Standard Insulation Co., E. Rutherford, N. J.

trial oils, insecticides, floor wax and many similar products.

Saran-coated paper, in which the saran resin is applied from a solvent solution, has been used with considerable success for several years, particularly on volatile products like antiperspirants. It has a low water-vapor transmission rate and supplies good chemical resistance.

Metallic-foil facings. Tin foil, 1½ to 2 mils thick, is used for sealing products like hydrogen peroxide, grain alcohol, drugs, flavoring extracts, oils, organic solvents, nail polish and remover, liniments and many other medicinals. Tin-foil facings are ideal in the packaging of medicinals, pharmaceuticals and biologicals containing highly volatile chemicals or preparations having a relatively high alcohol content.

Aluminum-foil facing is used in reasonably large quantities as a spot material with gutta-percha backing in metal crowns for sealing beer and the like. When duplexed to a suitable backing, it also is used in regular continuous-thread or molded caps for sealing nonalkaline products not too volatile in nature but containing ingredients that readily affect ordinary varnish, vinyl, polyethylene or saran facings. In most cases where aluminum foil is specified, it is desirable to use a composition cork backing because this type of foil has an inherently hard surface and a resilient cork backing permits better conformity to the glass container.

Lead-foil facing (chemically pure) has been used for sealing products such as concentrated sulphuric acids, radiator compounds, leather dressings, automobile polishes, petroleum hydrocarbons and aromatic solvents, radiator antifreeze and insecticides. Lead foil under no circumstances should be used for packaging food or other products that might come in contact with human or animal skin. Lead foil (composition) also is used in closures for sealing products like automobile polishes, petroleum and coal-tar solvents, certain cleaning compounds, radiator antifreeze and household furniture polish and cleaner.

Pliofilm facing is made by laminating a transparent sheet of rubber hydrochloride film 0.0012 in. in thickness to paper with a special adhesive. It was used in large quantities for sealing containers of many alcoholic beverages, such as whiskey, wines and gin, as well as chlorinated washing fluids, mineral waters, drugs and pharmaceuticals, and carbonated beverages. However, it is rapidly being replaced by more stable facings such as the saran film, vinyl and polyethylene already mentioned.

Polyester facings are produced by laminating ½ or 1 mil thickness of polyester film to paper or board. It has excellent gloss and color and unusual strength. However, it does lack the softness and resilience of saran film, vinyl and polyethylene. Polyester film is, of course, of considerable interest because of its unusual chemical and solvent resistance. Numbered among its properties are satisfactory resistance to solvents such as acetone, dioxane, ethyl acetate, trichloroethylene and xylene. Because of these, it may be considered in places where tin foil, aluminum foil and lead foil generally are used—and may result in savings over the cost of some of the metallic foils.

Waxed pulpboard. This liner is made by coating pulpboard with paraffin wax or a combination of paraffin, ceresine, microcrystalline and carnauba wax. A wax coating by nature is not always continuous and is, therefore, subject to liquid penetration. Waxed pulpboard is, however, an excellent liner backing to use when extra protection is needed. It may also be used by itself for sealing hard candy, pills, tablets, dry drugs, soluble coffee and other hygroscopic food products.

Waxed composition cork. This material is used in packaging products where the high sealing efficiency of cork is required and where the container contents are of a very mild nature and will not attack the wax component of the liner.

Waxed facings. It has been determined by experience that a wax coating applied to a liner facing such as varnished paper, saran or rubber-hydrochloride film greatly enhances sealing efficiency. This particular wax coating normally measures from 1 to 2 mils in thickness and obviously must be resistant to the product on which it is to be used. The function of this added wax coating is to aid the sealing properties of the liner by better conformity to the glass jar finish.

Wax coating designations for liners are characterized as follows: *heavy waxed*—over 2 mils of wax; *waxed*—about 2 mils of wax; *light waxed*—about 1 mil of wax; *E wax*—1 to 6 mg. of wax per sq. in. of surface; *LF wax*—surface treatment (too thin to measure); *wax bloom*—excess wax in coating comes to surface to form discrete film; *flash waxed*—about ⅛ mil of wax (usually on backing board).

Liner backings

Pulpboard and *newsboard* are the most popular backings and are used in the largest quantities by the closure trade. They are adequate for use in the sealing of most food products when duplexed to the proper facing. For food packaging, these backings are used for maximum economy.

Composition cork is conceded to be the most efficient liner backing because of its ability to compress readily at normal cap-sealing pressures and return to its original position. On the other hand, it has been found that composition cork must be backed with paper to reduce its tendency to curl which sometimes causes the liner to fall out of the cap. Cork backing with the proper facing material is recommended for sealing certain liquors, perfumes, volatile solvents, essential oils and the like.

Gray felt and *white felt.* These backing materials are used in fairly good quantities as liners in the closures for those products where pulpboard and newsboard have been found to be too hard and where the excellent sealing efficiency of composition cork is not required. Liners backed with white or gray felt have been found quite effective in molded closures having a relatively thin construction and subject to breakage when they are being applied to bottles. With a felt backing, greater compression into the liner is made by the glass finish at low sealing pressures. Felt backings have been found adequate for many volatile products.

Gasket

The broad mass-production field of vacuum packaging and hot processing of foods calls for a screw-cap, press-on or lug-type closure and a washer or gasket of rubbery material. Recent improvements include one type that achieves a continuous top, corner and side seal using a cap of fairly shallow design admirably suited to re-use needs of the consumer.

Flat rubber rings are used on vacuum products or products filled hot or hot processed after filling. Pour-in composition gaskets of natural or synthetic rubber are supplied in a water-emulsion or dispersion form.

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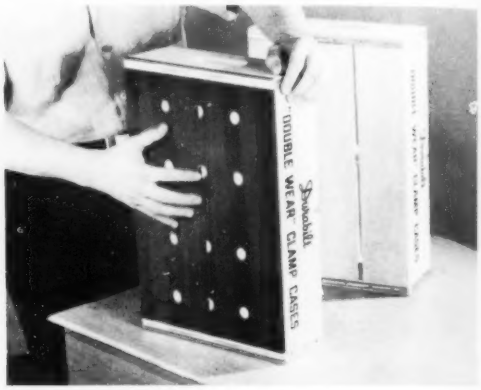
Owens-Illinois Containers, Closures and Fitments



Metal and plastic closures for bottles or cans, including screw, lug and side-seal types.



Glass containers for dairy products. Bottles and jars for milk and other dairy products. Shown here, the new Econobottle, convenient and inexpensive.



Bottles, cases for soft drinks. Non-returnable or returnable bottles. Shown, new Masonite® bottom wood case.



Glass containers for food, standard shapes or private designs in clear, amber or green.



Plastic bottles. Shapes and colors to customer specifications, sizes up to 60cc. Shown here new stock plastic bottle with built-in handle.

New shapes . . . constructions . . . features bring new convenience and sales to many products

We provide containers, closures and special fitments designed to do the best possible job of protecting and selling other people's products. We keep introducing improvements as our technical people find better ways to do these things.

If your product can be poured, spooned or sprayed, you can probably find the right container for it at Owens-Illinois. The items illustrated here are examples of what we could do for you.



Glass-and-plastic pressure containers. The plastic is bonded to the glass, will not peel off. Large selection of shapes, sizes, colors.



Beer bottles. Non-returnable or returnable. All shapes, sizes, colors. Shown, new "Handy" non-returnable, and model used to test its design features.



Wine and liquor bottles. Full line of shapes and sizes up to one gallon in clear, amber or various tones of green.



Glass containers for drugs and chemicals. Clear, amber, green bottles and jars. Shown here, the new lightweight pharmaceutical gallon.



Plastic fitments for containers. Many types to pour, sift or spray liquids or powders. Shown here, selected fitments for pressure containers.



Glass containers for toiletries and cosmetics. Distinctive shapes in clear glass, amber or green, or new sprayed-on ceramic colors.



Containers for pressure-packed toiletries. All shapes possible with glass alone are possible in Owens-Illinois plastic-coated glass containers.



Applied Color Lettering. On glass or plastics, ACL becomes a permanent part of the container. Glass chips shown illustrate some of the colors.

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Cellulose shrink-on bands

by Thomas W. Holland*

Even though they were developed before self-service came to be a factor in retailing, cellulose bands are packaging components that fit neatly into today's self-service, or self-selection, merchandising picture.

These tight-fitting neckband seals, used primarily on glass containers, do essentially these things: protect the product, prevent tampering with the contents and add selling impact at point of sale. Sanitary and odorless, they are inexpensive and can be applied effectively by either hand or machine operation.

Historically, the wine and liquor industries were the first, and are still the largest, users of cellulose bands. The need for a simple means of assuring that the customer would receive an unadulterated product led to quick and widespread adoption of bands in these industries. The bottlers later recognized their merchandising potential and today these protective neckbands, handsomely printed, are actually an important part of the over-all package design.

Taking their cue from this successful application, food and drug packagers are using the bands for the same basic purposes but have added several refinements as well.

The tamperproof protection provided by bands is more necessary than might appear on the surface. The removal of unbanded screw caps is quite simple in the typical merchandise display of today's stores. Shoppers can twist them off to check the package's contents, and once a food package is opened it is subject to contamination and spoilage which can easily damage the reputation of both brand and store. Equally troublesome is cap-switching —exchanging a cap bearing a high-price marking for a lower one.

Bands effectively stop this cap-switching practice and in many cases will enable packagers to change from pry-off lids to the more convenient screw-type caps, even on products where guaranteed purity is of special importance.

In drug packages, a guarantee of purity and quality is particularly significant and is being realized with cellulose bands on the products of many drug firms.

An important development in the use of shrink-on bands is their application as a seal on aerosol paint and food packages. The strong, snug-fitting band discourages casual tampering and "testing," assures the customer of full content measure and protects the manufacturer and retailer from possible in-store damage to nearby packages, displays, etc.

The merchandising importance of bands is recognized by many food producers and has been demonstrated in studies made of shopping habits. One such survey showed that 74% of all purchases of glass-packaged items result from decisions made in the store; and products sealed with cellulose bands outsold by almost 18% the

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SEAL SERVES AS A PACKAGE for six spools of fishing line. Seal is transparent on side not visible in photo. Spools remain individually packaged when removed by slitting seal. (*Du Pont photo*)



BANDS sealing plastic closure to bottles of mouth antiseptic concentrate carry information not supplied by new applied color labels and also protect product en route to customer. (*Owens-Illinois photo*)

REPLACEMENT WICK for deodorant product (*left, below*) is secured to package by a cellulose seal. Copy on seal explains that wick is under it. (*Du Pont photo*)

TWO PURPOSES accomplished by seal in photo below, right. It functions as a label and seals on cap to prevent tampering. (*American Viscose photo*)





same products in unbanded packages.

The sales appeal added by bands lies partly in the tangible guarantee they imply and partly in the effective use of the extra labeling space they provide.

Imprinted in bright colors or striking designs with trademarks, slogans or specific selling points, the bands catch the eye and quickly deliver the sales message. They often are used to vary the selling emphasis while the main label remains unchanged for maximum recognition value. Seasonal approaches, special prices and suggestions for use are frequently handled this way by packagers.

A printed message often calls attention to the protection afforded by the bands—for example, "This unbroken seal is your guarantee of quality."

A cellulose band may be used for a variety of additional purposes: to secure a decanter top to an apothecary-type jar; to band combination units, such as two bottles, two cans or two boxes; to secure a premium to a package; or to add seasonal decorations or greetings to regular year-round packages. The cellulose bands, of course, are readily removable from unsold stock when the holiday is past.

For small cylindrical objects—hearing-aid batteries or plastic vials—printed bands serve as the label. They are easy to apply and remain in place.

Cellulose bands are tough, flexible, seamless tubes with no toxic hazard whatever. They are noncombustible and are resistant to the effects of oils, fats, spirits and dilute acids.

Bands are made of cellulose in a process similar, to some extent, to the manufacture of cellophane. Wood pulp is converted by chemical reaction into a syrupy, amber liquid known as viscose. This is then extruded through a carefully controlled process into long tubes of the proper diameter.

Printing—or, more properly, chemical impregnation of the designs—is accomplished during the actual manufacture. Pigments for over-all color are added to the viscose before it is extruded and decorations are "printed" by the application of additional pigments while the cellulose of the extruded tube is still largely water. The process makes the design an integral part of the band itself and scuffing, flaking off or removal is prevented.

A wide color range is available. Pigments from black to white can be used and intermixes can produce almost any color. Although the design must be darker than the background color, any effect can be achieved. If light lettering is desired on a dark background, the band is pigmented with the light color and the "background" is then applied.

The surface of a cellulose band is smooth, untextured and can have a low or high sheen. Semi-lustrous surfaces also can be achieved.

A variation of the transparent band is the special pigmented one made for liquor bottles. It has a transparent window for protection and inspection of the revenue stamp. This was an early development of considerable importance in making possible the use of bands by this industry.

After the cellulose has been extruded into tubular form and decorated, it is then cut into proper lengths for the customer or prepared in rolls for machine application. Completed bands are immediately placed into a solution of water, plasticizer, preservatives and inhibitors. They are shipped in this solution in metal or plastic-lined containers and are kept in it until just before their actual application to the container.

The solution keeps the bands in perfect condition for long periods of time. Bands have been stored for years prior to use, but manufacturers generally recommend that routine storage be limited to one year or less. The preservatives and inhibitors prevent mold growth or cellulose deterioration; and the plasticizer, like that which is in the basic material, keeps the bands pliant and strong after application.

Shrinkage begins immediately after bands are exposed to air and normally requires about 30 to 45 minutes, but can be speeded up considerably by running the sealed packages through a heat tunnel. The bands will shrink properly even if the packages are cartoned right after the application.

Bands can be applied manually or by a wide variety of machines. A skilled worker will apply approximately 35 to 60 a minute. Techniques for application have been developed and can be demonstrated by band manufacturers.

Machine application speeds run from 70 to 210 bands a minute and many types of equipment are suited for high-speed production lines and for multiple-line service.

Some machines apply pre-cut bands to bottles and jars. A supply is loaded into a magazine and fed through a mechanical and vacuum system to an expander which opens the band; then a positioning mechanism slips it over the neck of the container spotted on a track in the production line.

Another type machine uses bands in roll form, cutting the tubing off under control to give proper position of printed bands.

Since a variety of machines is available, packagers can select machinery from several different price and performance ranges to meet the requirements of their own operation. Large packaging operations use high-speed machines in banks, while other manufacturers find manual application more effective and more economical.

For the most part, bands are made to order for the customer, although some unprinted types are available in some stock sizes. They can be made in diameters ranging from 12 to 102 mm. and in virtually any length which may be required.

To determine the size needed, measure the largest diameter over which the band is to pass. Then measure down the bottle or jar neck to the lowest point to be covered. The two dimensions are then expressed in millimeters, diameter first. (A 30 mm. by 50 mm. band is 30 mm. in diameter and 50 mm. in length.) The manufacturer will then supply a band which can be slipped into place easily and will shrink to these dimensions. It is usually desirable to furnish the band supplier with a sample of the actual package.

Although most bands are simply tubing open at both ends, a special form known as a cap is also available. Caps are closed at one end and are often used as primary closures, as, for example, on glass or plastic containers for tooth brushes. All bands were originally made in this pattern until it became apparent that they could fulfill adequately their function as secondary closures without the closed end.

Cost of bands, including application, can be less than one cent per package and depends heavily on the packager's exact needs and method of operation. Band prices vary according to size, color, amount and type of printing that is required.

Band manufacturers customarily work with packagers in developing appropriate size and type of bands and in working out designs and application methods.

Dispensers and applicators

by Harry Robbins*

Applicators and dispensers play a most important role in packaging. This, of course, is far from new, but in recent years many changes have taken place and each change has added a new value.

Let us take, for example, the still popular dauber which is used for applying shoe polish. Forty years ago it was made of a grass sponge around which was wrapped a piece of wire; the other end was jammed into a cork stopper. As time went on, the sponge was changed to wool, cotton or felt and the cork was still used as the stopper. About 1940 a new invention came about—the wire was simply riveted to a metal cap. The entire shoe-polish industry accepted this item, and other fields using daubers adopted it.

At present a polyethylene shaft also is being used in place of wire. This is used where the possibility of corrosion of the wire exists. Recently, squeeze bottles have come into the picture with daubers permanently attached to the top, allowing the liquid to flow through the top; therefore, opening and closing of the bottle is avoided. There is, of course, a premium price for this type of package. Although still rather young it has great potential.

Polyethylene, because of its durability, inertness and chemical resistance, has advanced most vigorously in the field of dispensing closures. Snip-off tips, pull-out spouts, sprinkler tops and dropper pipettes are being adapted for many products in food, cosmetics, drugs, industrial chemicals and many other categories.

Liquid products using brushes attached to screw caps, either molded or metal, play their very important role. Examples range from the tiny nail-polish brush, which has a polyethylene shaft fitted into the well of a molded cap, to the large metal shaft brush soldered or riveted into a metal screw cap and used for applying items of a more crude nature, such as tire cement and gasket cement. Each has its very important place. Consumers are aware of the efficiency of these applicators, and if they come across an item without one which sells at even half the price, they will prefer the one with an applicator.

A special class of dispensers still has its place in spite of aerosol cans. These include the pump-type sprayers used for window cleaners, room deodorants, tire cleaners and perfumes; also the pump type with nozzle used for hand lotions, hair creams and the like. These dispensers are not restricted to glass bottles. They can be used with caps for polyethylene bottles as well as gallon jugs and have a measured stroke capacity if needed.

Liquid and semiliquid products employ closures fitted with daubers, brushes or special applicators. They are used with bottles or cans. The sprinkler cap, while not new, is still a very popular item. Among the popular convenience packages are: the sifter and shaker types for dry prod-



POUR AND SEAL polyethylene pourer for syrups, etc., eliminates dribbling down side of can. (*Siax Industries photo*)

*The Applicator Co., Brooklyn, N.Y.



POPULAR AND FUNCTIONAL, daubers have been continually improved, making dispensing of sticky, messy products easy. Many types are available, for different purposes. (*The Applicator Co. photo*)



ADJUSTABLE-FLOW ROLL-ON. Plastic collar placed on threaded neck of bottle, in circumferential contact with applicator, regulates the flow of product. (*Closure, Owens-Illinois*)



PREVENTION of seepage and evaporation is achieved with polyethylene shank and flange, which has been preassembled to metal cap; retaining bead is part of cap assembly. (*Henlopen photo*)



LUBRICATING gun for small openings has polyethylene squeeze barrel, molded nozzle. (*Tube, Northwest Molded Products*)



NO-DRIP polyethylene nozzle and captive cap inserted in round or oblong cans with this machine. (*Continental Can photo*)



DIAL-A-DOSE three-piece unit is primary seal, variable dose dispenser. Doses 1 drop to 1 teaspoon. (*Dosamatic photo*)



POUR SPOUT opens into inner foil-laminated bag for easy dispensing of gelatins, dehydrated products. (*Alcoa photo*)

ucts; the polyethylene snap fit for jars used for all varieties of food seasonings; the retractable pouring spout for salt containers; the pre-punched sifter top, sealed with pressure-sensitive tape and used effectively for cleaning powders and other free-flowing items.

A new dispenser developed in recent years is the popular roll-on deodorant—actually the ball-point pen principle. Constant developments are being made through imagination and modification of existing dispensers, and this is a perfect example of one that has proved itself.

Packagers are constantly giving consideration to new dispensers. As a rule, most working dispensers cost extra money. At the same time, the successful ones help the product do a better job. These special devices are best indicated when their ratio of cost is in balance with the efficiency and economy they afford the consumer. And the customer willingly will pay a premium price for the dispenser if it in turn avoids waste, makes the product more effective and saves time.

A well-planned dispenser will pay for itself many times over. That is why so much care must be exercised in choosing the type best suited to the job and in making sure it will always work as intended.



PUMP-TYPE dispenser attachment readily converts a bottle into a convenience package. It also promotes brand loyalty and continuing use among consumers.

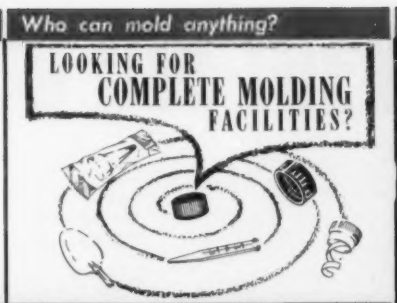


SURE-FEED construction of dispenser package channels adhesive strip to serrated metal cutting edge and prevents tape from falling back against roll.

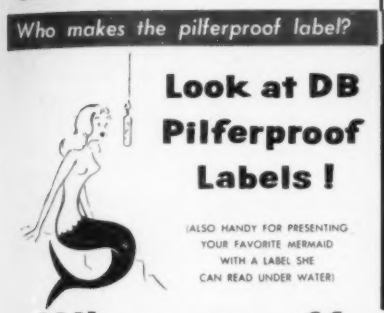


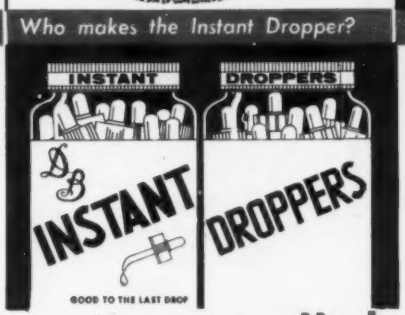
"PUSH-BUTTON" aluminum closure for injectables combines complete product protection with instant, one-hand opening; is a boon to diabetics, doctors. (*Alcoa photo*)

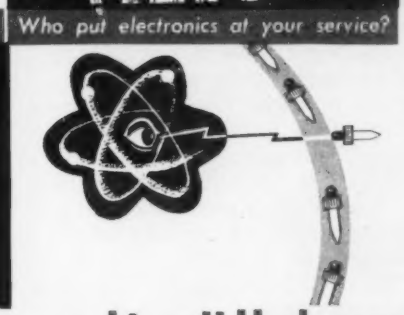












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CERAMIC DECORATING:

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DOUGHERTY BROTHERS

Buena, N. J.
OX 2–6100

Dropper assemblies go modern

by John F. Dougherty*

Dropper assemblies, important for their function as accurate metering devices, are adding a new value: aesthetic appeal. Caps, bulbs, and even pipettes, are molded into new functional shapes, in designs and colors to fit into family design packaging.

This "new look" extends far beyond the aesthetic. Automatic machinery permits production of a cleaner, safer product and reduces the cost. In spite of the rise in component parts, dropper assemblies cost 20% less than they did ten years ago.

Dropper assemblies are broadly classified into two categories—glass and plastic. In spite of a strong trend toward the use of thermoplastic material in the pipette portion, both glass and plastic have inherent characteristics which make one or the other preferable in specific applications.

Many advantages of plastic in the pipette are obvious. The pipette will not break; it is free from sharp edges, is easily calibrated for dosage, is readily assembled to the closure and bulb; and it may be manufactured in large volume at low cost.

Molds for private designs, however, are relatively high, limiting their use to either large volume items, where low cost manufacturing will offset mold costs, or to prestige items.

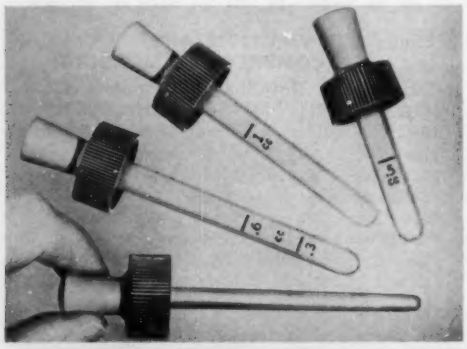
Glass tubing is readily subject to form changes and (without mold expense since no mold is involved) allows the pipette to be fabricated into designs and shapes not readily available in thermoplastic materials. Glass minimizes the problem of compatibility with the product. Pipettes can be formed from common lime glass and from any borosilicate glass including Pyrex. Handsome, compatible calibration marks can be applied automatically by the applied-color method of labeling. In considering pros and cons of glass and plastic, we must consider one basic disadvantage of glass—it is breakable.

The cap. Any closure, metal or plastic, can be adapted to dropper assemblies. The field is wide open, however, to imaginative planning. Coming into more use are thermoplastic materials for injection molding, which will allow more variety in matching colored components to product-identification colors. Droppers are produced with closures of aluminum, phenolic, urea, polystyrene and other plastic materials in sizes ranging from 13 mm to 28 mm and in various styles including rolled-on tamperproof.

The bulb, usually fabricated from natural rubber, also is available in synthetic compounds of rubber and thermoplastic materials. Most widely used, however, is a rubber formula. Bulbs are available in any desired color and a fine job has been done on color matching them to specific requirements. They range in sizes from 13 mm to 28 mm, with in-between sizes at nominal mold costs.

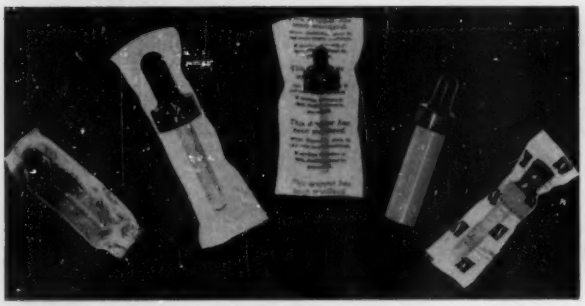
Glass and plastic dropper assemblies can be sterilized, the glass assembly by steam or the gas method, and the plastic assembly, in most instances, by the gas method only. The sterile assemblies can be wrapped by any of the acceptable heat-sealable materials, principally cellophane and glassine, and several automatic machines have been developed for this. In addition, several types of dust wraps are offered for dust protection and neat appearance, including the new boat-type wrap designed for automatic packing, greater attractiveness, better stacking and handling. (For other dispensing devices, see also p. 377.)

* Director of Sales, Dougherty Brothers, Buena, N.J.

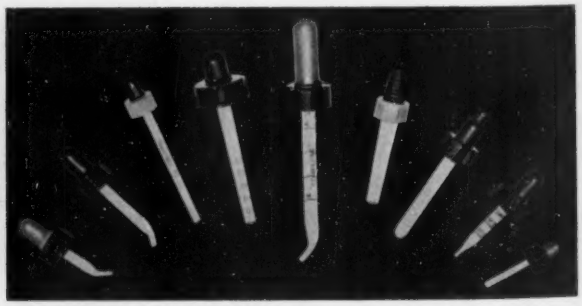


FLAT-PIPETTE dropper shows trend to both aesthetic and functional. Shape and color of bulb and cap blend with package design; flat thermoplastic pipette functions as tongue depressant in vitamin dispensing.

PHOTOS COURTESY DOUGHERTY BROTHERS



WRAP STYLES. Shown left to right are: boat, dust, sterile, tube, and dust wrap individualized by brand name. Wrapping achieves sterility, aesthetic appearance, identification, packing convenience. Any heat-sealable material may be used.



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See other Avisco packaging materials pages 56, 57, 186 and 667.



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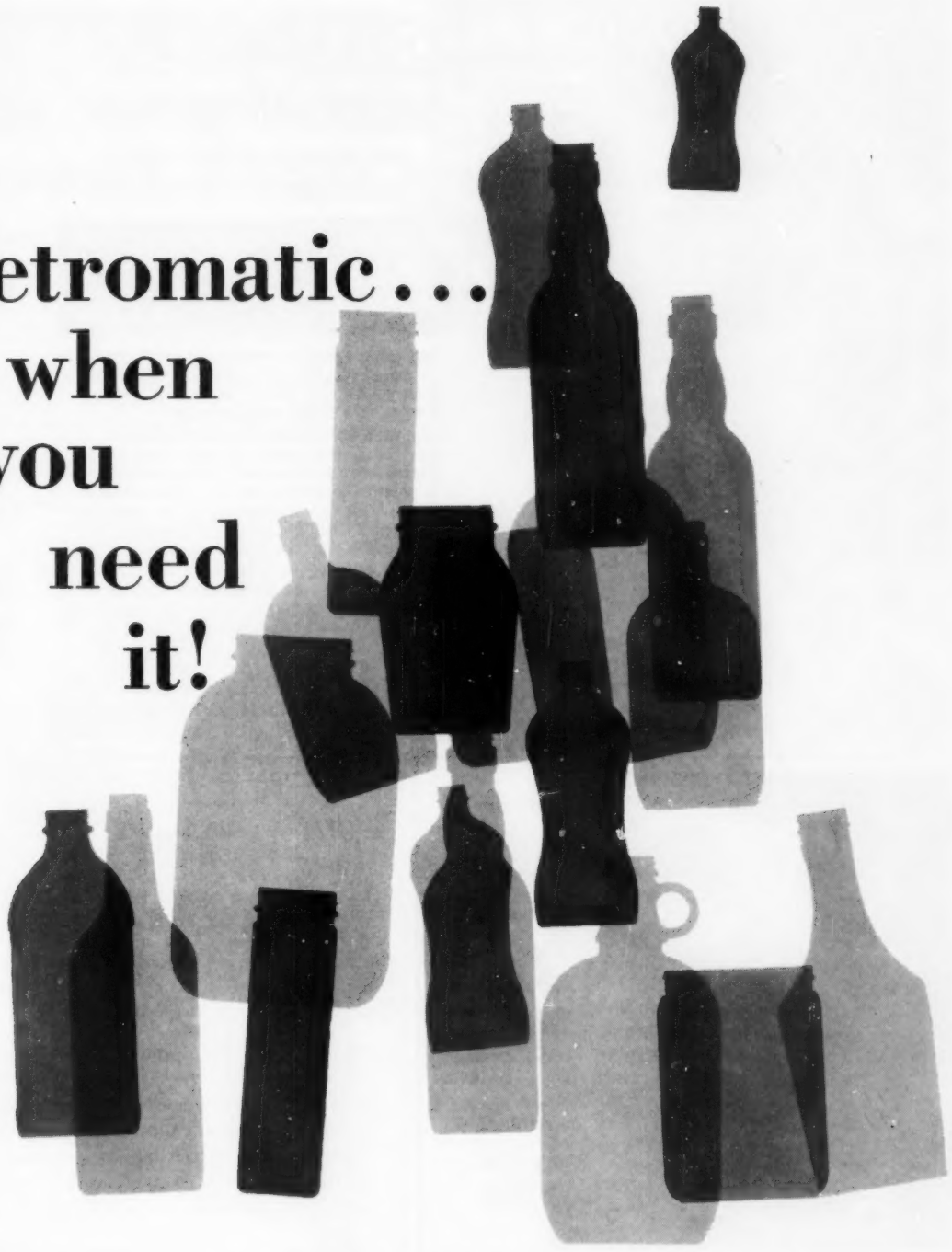
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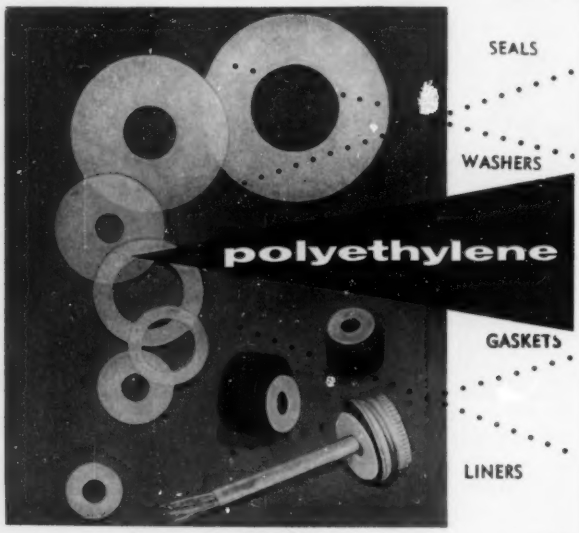
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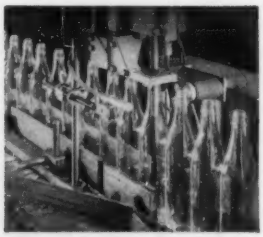
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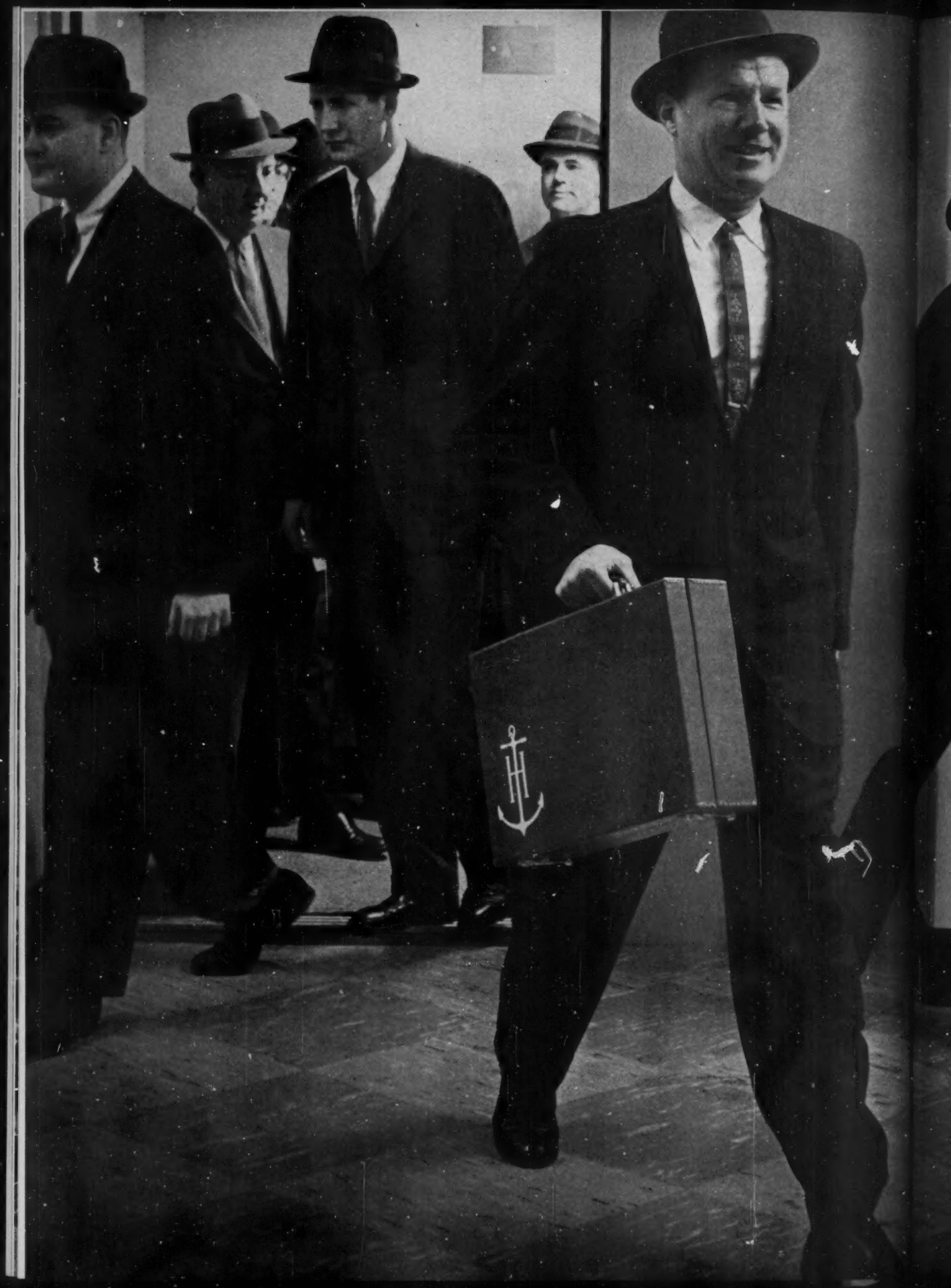
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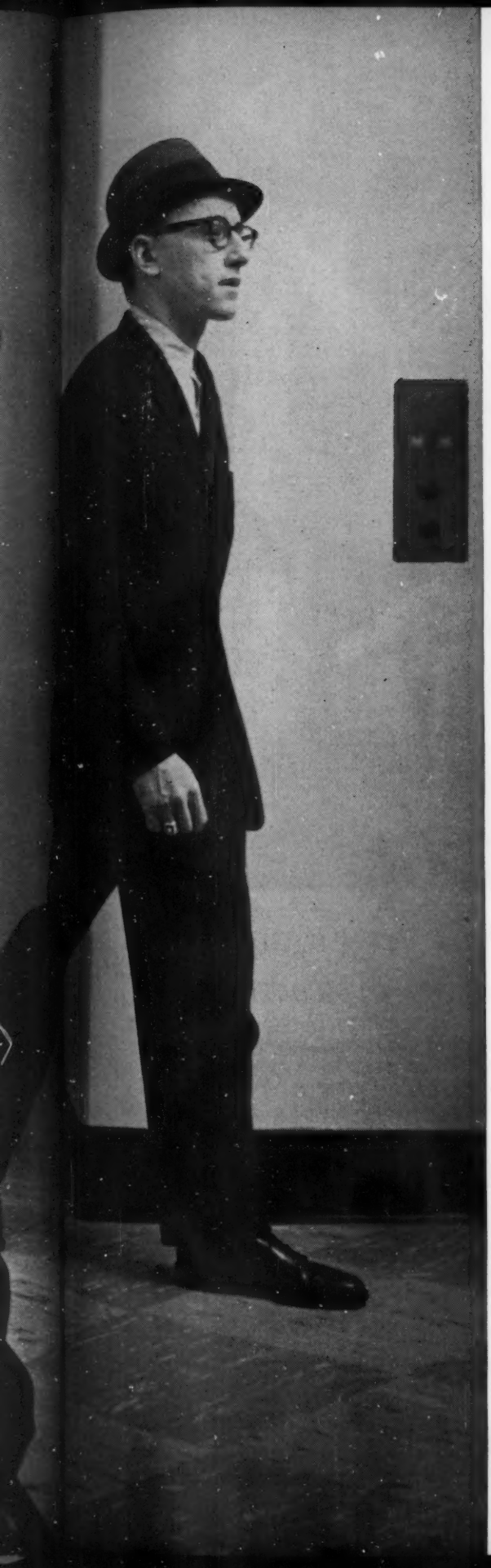
For additional information, refer to our ad in the Plastic Packages Section, page 265

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Advertisers' Index by Subject Matter

AEROSOLS, VALVES, PROPELLANTS

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SECTION 11

AEROSOLS, VALVES, PROPELLANTS

Successful aerosol packaging

Basically, an aerosol consists of a gastight, valved container filled with a formulation of propellant and active ingredient. When the valve is operated, the gas pressure in the package pushes the propellant and active ingredient through the tiny opening or orifice in the valve. As it leaves the valve orifice, the propellant expands, rapidly blasting the active ingredient into extremely small particles. Thus, fine mists, coarse sprays, foams or puffs of dust are produced—depending on the product, propellant and valve.

In the case of insecticides, aerosols have resulted in a greatly expanded market. Since the aerosol fills the air with microscopic particles that float longer and penetrate more space, it is highly effective in killing pests.

Aerosols make possible the introduction of new products such as Snow and hair lacquer, which simply would not exist if it were not for the aerosol.

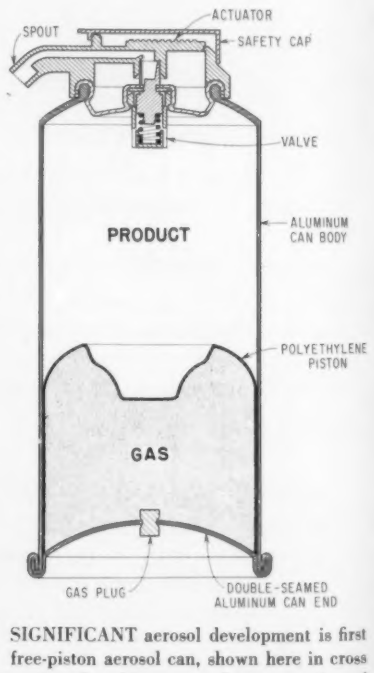
Aerosols put old products into new outlets—paints into drug stores and flower sprays and fire extinguishers into self-service stores. Aerosols change consumer habits, too. The aerosol shave in just three years became the top packaged product in the shave-preparation field. Aerosol shaves have maintained and increased their lead ever since.

Hair sprays have enjoyed an even more spectacular growth. In 1954, they were a minor factor in the field. In 1960, they were the largest-volume aerosol produced. This success story highlights one of the aspects of aerosol marketing that makes it so exciting and so demanding of study on the part of packagers. The fact that an aerosol is a "working package" means that very fast and very large growth of sales awaits the marketer with "new and natural" applications.

Containers

One reason the aerosol package offers new opportunities is that progress has been made in developing a wide range of containers to help meet a diversity of product and merchandising needs. Available, at present, are steel-tin cans, aluminum containers, uncoated glass, plastic-coated glass, and glass in a fibreboard sheath as well as stainless steel cartridges.

Plastic containers have entered the aerosol field. Melamine and nylon containers are available. Plastics should contribute importantly to aerosol progress by meeting the need for a break-resistant material that lends itself to attractive design. "Delrin" acetal resin containers are a promising candidate for aerosols. This plastic is highly break resistant and has good barrier properties. The bottles are



SIGNIFICANT aerosol development is first free-piston aerosol can, shown here in cross section. It achieves complete separation of product and propellant and practically complete expulsion of product. Diaphragm of medium-density polyethylene moves upward under pressure of bottom-loaded propellant until all product is discharged. *(Drawing, Bradley-Sun Div., American Can Co.)*



BEST AEROSOLS in 1960, chosen in CSMA contest, include containers for (from left): deodorant, shave lotion, hair spray, food, starch, tire cleaner, spot remover, dry lube, insecticide, pet spray, air freshener, cologne, foot powder.



OVERCAPS shown are designed for attractiveness, easy stacking, price marking. Center cap is new snap-lock type, others have inner gripping device. *(Sterling Seal caps)*



MULTI-FUNCTION RESIN. Corrosion resistance of acetal resin enables it to function equally well as a valve component inside an aerosol container (see cutaway section of insecticide can) or as material from which container itself is made. Shelf life of aerosols with acetal resin is said to be at least three years. *(Du Pont photo)*

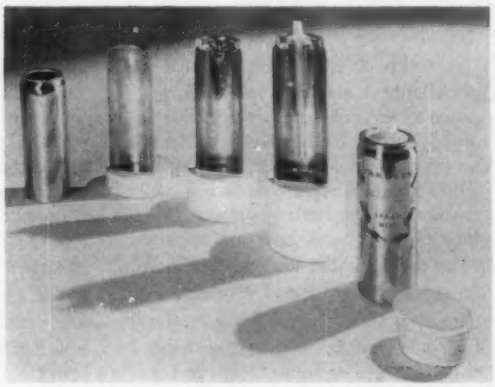
more economical than some plastic containers that might be considered.

The conventional aerosol container is the general-line, steel-tin beer-type can available in 16-, 14-, 12-, 8-, 6- and 4-oz. sizes. Personal products, employing smaller-size containers, have enjoyed vigorous growth in popularity. It is logical to assume more of the smaller containers will appear because (1) they lend themselves to certain more dainty products, (2) space in the medicine cabinet is at a premium, (3) they open up entire new marketing areas especially for travel sizes, and (4) advances in containers make them more practical.

An important development to watch is the renewed and increasing interest in aluminum containers. New methods of manufacture, improved linings, better loading and filling techniques, and the prospects of costs that will be more competitive should result in much wider use of aluminum containers. They are readily available in a range of sizes and distinctive shapes.

Glass aerosol containers are important because of their inert surface plus the fact that the beauty and moldability of glass lend themselves to the traditional packaging requirements of perfumes, colognes and other toiletries. Because the aerosol is a pressurized product, attention must be given to the safety of the container.

Some cologne and perfume formulations use a propellant pressure—under 25 lbs. per sq. in. gauge at 70 deg F. The formulation is so "engineered" that an excellent spray is produced even though the pressure is so relatively low. Even in this type of aerosol, the strength of the container must be carefully considered. Oval or hour-glass-shaped designs are specified to assure structural strength.



ALUMINUM aerosol containers like these offer strength plus wide choice of sizes. First view and cutaway next to it show aluminum tube after it has been extruded, trimmed, coated, its shoulder formed and its neck curled inward. Second cutaway—cup-shaped top inserted with folded-in gasket, so it interlocks with curl. Right—dispensing valve has been inserted. *(Peerless Tube aerosol)*

For greater safety and for reasons specific to his individual needs, the packager can employ aerosols coated with a thin protective film of transparent or colored vinyl chloride.

Glass aerosols have enjoyed a very rapid growth and the actual number marketed is considerably higher than the quantity reported in the statistics (see below). This is because several major users of glass aerosols are not represented in the reported totals.

All authorities are agreed that uncoated glass should be considered only for certain formulations. Uninformed or unscrupulous handling of safety considerations could be dangerous.

The vinyl-coated bottles offer greater safety, but are more expensive. Glass also can be used in combination with outer containers of fibreboard, molded plastics and metal.

The future of many pressure-packaged drugs and personal items is undoubtedly intimately related to glass containers, particularly to advances that make glass safer and less costly.

Aerosol types. The conventional aerosol is a two-phase formulation, wherein the active ingredient either

Nonfood aerosols—1951 to 1960*

	Glass containers (all sizes)	Metal containers Over 6-oz.	Metal containers 6-oz. & less	Reported Total	Official Total[1]
1951	—	25,478,425	8,049,126	34,184,150	—
1952	—	63,439,015	32,569,541	96,618,905	—
1953	—	80,575,853	47,282,299	131,515,442	140,000,000
1954	—	85,394,617	83,324,051	169,362,104	185,000,000
1955	10,411,560	119,719,706	104,984,499	236,783,520	240,000,000
1956	15,092,994	151,035,187	127,062,272	293,190,453	320,000,000
1957	21,279,442	167,870,732	150,340,628	339,490,802	390,000,000
1958	11,262,234	171,120,748	159,000,514	341,383,496	470,000,000
1959	25,259,999	286,097,522	186,930,422	498,287,943	575,000,000
1960	42,901,675	364,810,437	199,280,258	606,992,370	670,000,000

*Source: Chemical Specialties Mfrs. Assn. 1 Adjusted to include estimated non-reported total.



FOOD AEROSOLS such as this have great market potential but still present problems involving formulation, processing, sanitation. Important provision must be convenience warranting cost of aerosols for regular food items. (*Crown Cork & Seal photo*)



FOOT POWDER application is effective and economical from extruded aerosol can. Reverse taper green cap tops attractive design. (*Walter Frank photo*)



PURSE-SIZE aerosol for hair spray is refilled from larger can (right). Special actuators fit on easily for spraying action. Glass bottle may be encased (center) for purse use. (*G. Barr & Co. photo*)

mixes with or is in solution with the propellant. A second type of aerosol known as the three-phase aerosol is designed for water-based ingredients—the product "floats" on the propellant.

Because the aerosol is a relatively complex and expensive package, much planning and know-how are required in the development and production of a successful pressurized product. The average nonfood aerosol costs about 20 cents—containers average about 4 cents; valves, 4 cents; liquefied gas propellant, 7 to 10 cents; and loading, 3 to 5 cents. Food aerosols and nitrogen-propelled aerosols are said to average about 12 cents, the lower cost being due to the inexpensive compressed-gas propellants. Despite this cost—roughly two to four times as much as nonpressurized products in cans or bottles—consumers love the aerosol. It appeals to our desire for efficiency; it does the job better, faster and, frequently, even more economically. For example, in colognes there is no evaporation and strength is preserved throughout the life of the package. For difficult paint jobs and small paint jobs such as home radiators, there is no mixing, no brush to buy or clean, and the product is preserved until entirely used.

Aerosols for foods

The food aerosol has immense potentials. Toppings have been improved continually—and they are one of the best examples of what a modern package can do to help make a new type of product a success.

Products that have been introduced or which are being considered include chocolate syrup, orange drink concentrate, instant coffee, flavorings, colorants, mustard, ketchup, salad dressing, cake frosting and various types of spreads.[1]

The 16-oz.-size container is becoming increasingly popular for pressurized foods, and this is a logical development in the interest of economy, since several of the components have fixed costs regardless of size.

The principal propellants for foods

[1]See "The Status of Food Aerosols," MODERN PACKAGING, Feb., 1961, p. 121.

Number of nonfood aerosols produced in 1959 and 1960*

	Glass & Plastic Containers (All Sizes)		Metal Containers				Total	
			Over 6-oz. '8, 12, 16)		6-oz. & less			
	1959	1960	1959	1960	1959	1960	1959	1960
Space insecticides	—	—[1]	37,362,250	36,665,214	1,388,398	452,961	38,750,648	37,118,175
Residual insecticides	—	—[1]	17,974,384	19,602,065	3,531,698	5,897,230	21,506,082	25,499,295
Mothproofers	—	—[1]	5,592,324	4,851,195	61,720	—	5,654,044	4,851,195
Room deodorants	—[1]	—[1]	23,971,255	26,862,849	35,752,334	39,892,021	59,723,589	66,754,870
Paints, coatings	—	—[1]	46,206,457	56,928,753	6,349,379	10,277,791	52,555,836	67,206,544
Snow — all types	—	—	8,237,772	7,338,621	721,409	614,129	8,959,181	7,952,750
Glass cleaners	—[1]	—	18,269,324	17,677,986	200,888	—[1]	18,470,212	17,677,986
Shoe, leather dressings	—[1]	—[1]	4,484,966	1,586,889	9,254,103	13,787,802	13,739,069	15,374,691
Waxes, polishes[2]	—[1]	—[1]	7,209,699	35,092,404	4,633,739	5,111,661	11,843,438	40,204,065
Starches	—	2,008,168	—[9]	17,788,307	—[9]	—[1]	—[9]	19,796,475
Other household items[3]	—[1]	—[1]	24,187,537	7,981,085	410,372	1,071,875	24,597,909	9,052,960
Shaving lathers	—	—[1]	20,658,801	22,086,323	51,952,158	46,088,108	72,610,959	68,174,431
Hair lacquers	—[1]	1,891,229	48,489,087	74,758,890	31,198,387	35,211,140	79,687,474	111,861,259
Dental cream	—	—[1]	—[1]	2,784,968	11,241,523	—[1]	11,241,523	2,784,968
Medicinals and pharmaceuticals[4]	3,329,752	2,524,668	426,829	703,345	6,279,731	8,548,823	10,036,312	11,776,836
Colognes and perfumes								
Over one oz.	18,586,393	19,018,940	—	—	9,798,833	8,732,276	28,385,226	27,751,216
One oz. and under	2,211,201	4,896,015	—	—	3,481,034	6,373,287	5,692,235	11,269,302
Other personal items[5]	666,622	—[1]	3,782,039	568,005	7,792,977	9,513,199	12,241,638	10,081,204
Veterinarian and pet products[6]	—	—[1]	3,014,743	3,970,125	1,098,282	740,811	4,113,025	4,710,936
De-icers	—	—[1]	—[9]	13,926,336	—[9]	280,642	—[9]	14,206,978
Miscellaneous items[7]	—[1]	—[1]	16,230,055	12,205,587	1,783,457	2,514,251	18,013,512	14,719,838
Unreleased categories[8]	466,031	12,562,655	—	1,431,490	—	4,172,251	466,031	18,166,396

*Source: Chemical Specialties Mfrs. Assn.
[1] Not released.
[2] Formerly included under "other household items."
[3] Upholstery, rug, oven cleaners, water repellents, etc.
[4] Athlete's foot, burn sprays, etc.
[5] Shampoos, deodorants, depilatories, sun-tan lotions, etc.
[6] Shampoos, deodorants, insecticides, etc.
[7] Mildew preventative, fire extinguishers, industrial lubricants, etc.
[8] Total of items (footnote 1) not categorized because too revealing.
[9] New category in 1960.



DUAL-ACTION aerosol. Sun-tan lotion is dispensed as foam for convenience and turns to liquid for effectiveness when applied. Other uses: shave lotion, nail polish remover, cologne, wave lotion, insect repellent. *(Allied Chemical Corp. photo)*

are nitrous oxide, carbon dioxide and nitrogen (see p. 403).

Despite the advances gained to date where food aerosols are concerned, there are still many formidable problems. The preservation problem that applies to all foods, and which is critical to most, must be carefully considered and dealt with by the packager. High temperatures for processing and low temperatures for preservation present problems. Purity and sanitation, of course, are especially important since many products are not consumed at one time but are used, and stored, and used again. Thus the risks of careless handling are probably greater than with nonpressurized foods. However, permanent exclusion of exterior elements, including air, will offer compensating advantages.



MECHANICAL BREAK-UP VALVE makes possible the use of uncoated glass container and more original designs for aerosols. Valve dispenses fine spray even at low pressure required for use in uncoated container. *(Risdon Mfg. Co. valve)*

Check list for aerosol and pressure packages

This pre-marketing check list, prepared by the Aerosol Div. of the Chemical Specialties Mfrs. Assn., New York, assumes that the various marketing questions have been answered and that management has decided to go ahead with the development and marketing of the product. This list, of necessity, refers to the broad base of all aerosol products and is meant to be applicable to all products in this category. A check list specific to pressurized foods is available from C.S.M.A.

Formulation checks

1. Temperature characteristics (stability, viscosity) of nonvolatile concentrates at: (a) 100 deg. F; (b) 70 deg. F.; (c) 0 deg. F.; (d) —20 deg. F.

2. Compatibility of nonvolatile concentrate with propellant: (a) critical solubility range; (b) effect of ratio of propellant to concentrate on stability; (c) effect of temperature on stability of combination of propellant and of nonvolatile concentrate (1) at 100 deg. F., (2) at 70 deg. F., (3) at 0 deg. F., and (4) at —20 deg. F.

3. Specific heat of concentrate.

4. Characteristics of vapor-pressure (curve below boiling point through 170 deg. F.).

5. Specific heat of propellant.

6. Coefficient of expansion of completed formulation of nonvolatile concentrate and propellant (giving headspace requirements).

7. Determination of flammability of product.

8. *p*H of product.

9. Density of product.

10. Determination of toxicity: (a) review of literature on various ingredients; (b) confirmation of literature reports by: (1) mist-chamber tests, (2) shock of massive-dose-type topical application, (3) chronic topical application, (4) diet tests, (5) skin-sensitivity tests.

11. Effectiveness of product for purpose intended, determined by commercially accepted techniques: (a) Association test methods; (b) Federal specifications; (c) ASTM standards; (d) Bureau of Standards techniques.

Container and valve checks

Accelerated aging at laboratory level in actual container with valve as well as individual components under pressurized glass:

1. Does product affect container? (a) effect on internal coating, lacquer or plate; (b) effect on the container seam component.

2. Does product affect valve mechanism? (a) metal components; (b) elastomeric seals; (c) plastic components.

3. Performance of valve with formulated product: (a) spray characteristics; (b) spray rate; (c) valve action.

Valve and container selection

Check container components for:

1. Suitability to formula
2. Bursting strength
3. Effect of formula on can finish
4. Susceptibility to valve clogging
5. Delivery rate of valve
6. Spray characteristics of valve
7. Valve attachment to dispenser
8. Siphon-tube selection
9. Valve testing prior to use
10. Commercial history
11. Sales appeal
12. Adaptability to other products
13. Tamperproof or safety seal
14. Packaging of empty dispensers
15. Packaging of filled dispensers.

Use tests

1. Effectiveness of product.
2. Development of instructions and labeling (directions and cautions).
3. Determination of odor.
4. Ease of operation.
5. Possible adverse effects in use.
6. Flammability hazards.
7. Test pack for storage data at various temperatures and various positions of container in storage: (a) effect on container and valve components; (b) changes in pressure characteristics of product; (c) changes in odor, color and *p*H; (d) effect on valve of intermittent spraying; (e) effect on delivery rate and of tendency to leak; (f) crystallization in expansion chamber.
8. Determination of product cost, exclusive of manufacturing cost.

Manufacturing

1. Bill of material.
2. Filling-processing procedure.
3. Quality controls for: (a) raw materials; (b) processing; (c) product.
4. Manufacturing cost.

Regulatory considerations

1. Production & Marketing Admin., U. S. Dept. of Agriculture.
2. ICC and Bureau of Explosives.
3. Food & Drug Administration.
4. State and municipal regulations.

AEROSOL VALVES

by Joe Pizzurro*



TAILORED-TO-PRODUCT DISPENSING. Specially adapted valves dispense chocolate topping as a foam; multi-vitamin syrup in drops; permanent wave neutralizer and waving lotion in a stream and shoe polish in a spray. *(Precision Valve photo)*

The brief history of aerosols has been one of great progress, including rapid advances in producing more effective, more economical valves. Present research work still centers around the development of valves to do new jobs or do existing jobs better. Evidence of this is found in certain aerosols for starch, shoe polish and hair-curlers that employ new refinements in valve construction. Currently research is being directed toward the improvement of feeding and pressure-filling characteristics of valves in order to permit better handling on high-speed lines.

Types of valves

An aerosol valve is a skillfully designed and constructed mechanism devised to dispense a product under pressure, while maintaining both product and propellant sealed hermetically until the product is completely used.

All aerosol valves have similar basic components, such as:

1. Dispensing actuator
2. Valve stem
3. Sealing gasket
4. Valve housing
5. Mounting cup
6. Spring or toggle return action
7. Dip-tube, except in the case of upside-down valves.

All aerosol valves may be conveniently classified under five different headings based upon the method which is to be used for dispensing the product:

1. Spray valves
2. Foam valves
3. Stream valves
4. Metering valves
5. Drop dispensing valves.

In addition to these basic divisions, the spray valve can be further subdivided according to variety of formulations and on the basis of differences in content:

1. Valves that spray a homogeneous solution of propellant and product: for example, insecticides and room deodorants.

2. Valves used for three-phase systems comprised of separate layers of liquid propellant, product and vapor propellant, including some window-cleaner, starch and wax sprays.

3. Those that spray a suspension of solids in a liquid propellant, such as paints and powders.

4. Valves that dispense an emulsion of propellant and product: for example some water-base products, including window-cleaners, polishes and shave cream.

5. Valves to spray products propelled by compressed gas, such as some pet sprays, barbecue sauce, and the like.

The latter two types of valves are used with systems that have not been extensively developed but which have much promise for products now using more conventional systems and for products where successful aerosols have yet to be developed.

Although the technical aspects of valve construction are numerous and the variants on a basic valve innumerable, both the objective and the



NON-METALLIC valves, on plastic-coated bottles, used for five new water-based pharmaceutical and cosmetic aerosol products to eliminate possibility of corrosion or product contamination. Actuators vary according to the product. *(Risdon Mfg. Co. photo)*

* Research director, Precision Valve Corp., Yonkers, N. Y.

operation of an aerosol valve are actually quite simple. An aerosol valve is merely a device which maintains a constant seal on a container while allowing the contents, or any part of it, to be removed with a minimum of effort. Thus, the product is dispensed in the desired manner and both product and propellant are protected from contamination. Prime factors to be considered by product manufacturer are whether "product was dispensed desirably" and "product and propellant are protected against contamination." The aerosol valve industry has accomplished these objectives in the many fields now using this modern package. Hair sprays, bug sprays, shaving cream, toothpaste, chocolate syrup and vitamins are all being successfully packaged and sold in "push button" containers.

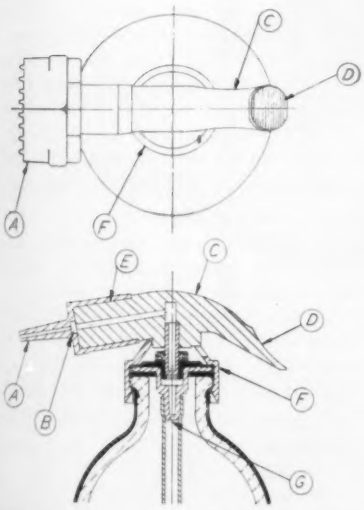
Currently, aerosols are expanding into the pharmaceuticals and foods fields. These have created new situations for the valve manufacturers to solve. For example, the dispensing of highly viscous liquids such as syrups caused the valve manufacturers to redesign valve stems, developing some with three and some with six openings to accommodate an acceptable flow rate. New spouts have been made to handle these heavy fluids and to improve convenience of the package.

A continuing problem in the valve as well as the container field is developing a can liner and a mounting cup coating which will be compatible with the product to be dispensed. Many products contain ingredients that have a corrosive action on metal. In the case of mounting cups, the industry has been able to stay a step ahead of the needs. Vinyl and epon coatings have been developed that successfully resist corrosion from both product and propellant. When new products are packaged, incompatibility problems that arise will be solved through the development of new and different coatings which are designed to do a really effective job of inhibiting corrosion. The problem of corrosion, of course, can be solved for some products by adopting glass containers. Both coated and uncoated bottles are now in use, and valve-ferrule combinations used with glass are found adequate.

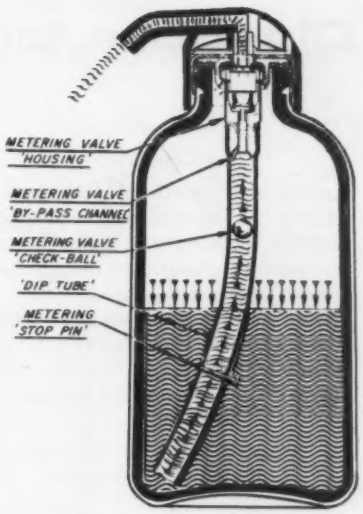
For the future, the valve industry currently is working out several problems. High viscosity products as yet cannot be dispensed in a spray form. The present mechanical breakup systems cannot, as yet, handle such products as salad oil. Some solid products cannot be dispensed through an aerosol valve without clogging. Metering valves still have limitations; for example, metering amounts of more than one ounce are still difficult to accomplish.

The neophyte in aerosols, and there will be hundreds of firms that will start packaging in this "consumer demanded" container in the coming year, will find competent help from valve manufacturers, contract fillers, container companies and propellant manufacturers. This comparatively new and expanding industry is extremely cooperative and research facilities are numerous and competent.

In considering an aerosol package, the newcomer must first consider his objectives: how should the product be dispensed—spray, foam, drop, stream or metered stream? This does not mean the aerosol should dispense the product in the same manner as when not pressure dispensed. In many cases, a product that was poured from a bottle might well be more convenient in a spray form—for example, barbecue sauce. Or, it might be more useful as a foam—for example, cream.



UNIQUE COMB-SHAPED actuator, used in combination with non-metallic low-flow aerosol valve, designed for uniform distribution of Lilt waving cream. (A) 1-in. wide detachable polyethylene comb emits lotion between two rows of teeth; (B) tiny interior orifices of comb join actuator at (C); (E) actuator slips into notched plastic collar (F) which maintains correct alignment of actuator; (G) internal restriction controls product flow. (*Risdon Mfg. Co. drawing*)



METERING VALVE operation is dependent on movement of check ball. As it reaches top of dip tube, it seals off valve. When actuator is released, ball falls down to stop pin where it is in position for next metered dosage. Quantity dispensed is controlled by position of stop pin in relation to size of dip tube. (*Precision Valve drawing*)

The next consideration would be particle-size required and flow-rate desired. If spray dispensed, the pattern wanted must also be evaluated. After the compatibility of mounting cup coating and product is determined, the valve manufacturer will have sufficient information to help the packager plan the formulation of product and the package. The product manufacturer must consider the kind of container he requires from the points of appearance and product compatibility (See also p. 26).

If the packager is doing his own aerosol development work, he will deal directly with the valve supplier, as well as with container and propellant manufacturers. If a contract loader or consultant is developing the aerosol, the developer will act as liaison with the supplier. Either way, it is suggested the packager take part in helping the valve manufacturer provide the required valve so that product and merchandising needs will be fully known and considered.

If you want a good basic rule to follow in obtaining valves, be sure you always specify the *materials* of construction and the *dimensions* for *each* component of the valve: actuator, stem, sealing gasket, housing, cup, spring, dip tube or similar essential part. Also specify colors and intended use.

Dip tubes for aerosols

by Leo Gans*

Continued growth of the aerosol industry has required comparable innovations, improvements and changes in a principal component of this dispensing package—the dip tube.

Dip tubes are multifunctional keys to aerosol performance, serving to:

1. Convey the liquid from the bottom of the container to the dispensing valve at the top
2. Act as a meter for the contents
3. Make propellant dispense contents correctly.

Choice of plastic material or compound for a particular dip-tubing application depends on specific property requirements with respect to: (1) chemical resistance; (2) environmental and thermal stress crack resistance; (3) appearance, color and transparency; (4) elasticity, elongation and stiffness; (5) toxicity.

Most polyethylenes and nylons have the chemical resistance required. Yet early work showed clearly that an accelerated breakdown of the compound occurs if it is stressed, as in tubing stretched over a valve nipple. This breakdown is increased in the presence of heat and various chemicals such as detergents, solvents and essential and other oils. This property, primarily occurring in polyethylene, has only recently been recognized and studied extensively. It is termed "thermal and environmental stress cracking."

Accordingly, special polyethylene compounds have been developed to reduce the environmental stress cracking of the material. In this connection, quantitative testing for rapidly evaluating tubing for stress-crack resistance has been devised.

Certain specialized needs call for plastics other than polyethylene. Aerosol fire extinguishers, fingernail lacquers and some paints require carbon tetrachloride-resistant dip tubing, for which nylon is specified. Metering tubing requires greater stiffness and is, therefore, extruded from high-density polyethylene compound.

Many considerations determine the mechanical specifications of the dip tube. The inside diameter is governed by the actual size of the valve nipple; the wall thickness, by the type of material chosen; and the length, by the height and contour of the container.

The tubing may be supplied in coils, on disposable spools, in random straight lengths or cut to finished size. Tubing put up in spools will keep its slight curvature which permits it to reach the lowest point of a container with a convex bottom. In those limited applications where a straight tube is required, long lengths or pre-cut tubes are supplied. The latter may be furnished with angular or pinked cut ends, which prevent bottoming of the tube and clogging of the opening, and are specified for rapid discharge applications such as fire extinguishers.

Although the majority of tubing is used on the standard aerosol valves, rigid and flexible extrusions are used in lotion pumps, sprayers, pouring spouts, atomizers, syphons and breathers. The extrusions may be made with any combination of inside and outside diameters; plain, fluted or beaded walls; in multiple strands; or fabricated to specified curvature.

The introduction of the metering valves which dispense small quantities, or even drops, has required the introduction of a line of small bore tubing with inside diameters ranging from 0.010 to 0.025 inch. This tubing requires little priming by the aerosol consumer due to its low capacity. The small bore also increases the internal friction, limiting flow of the dispensed liquid. Tube walls are kept over 0.030 in. to provide tubing stiffness needed for the staking operation.

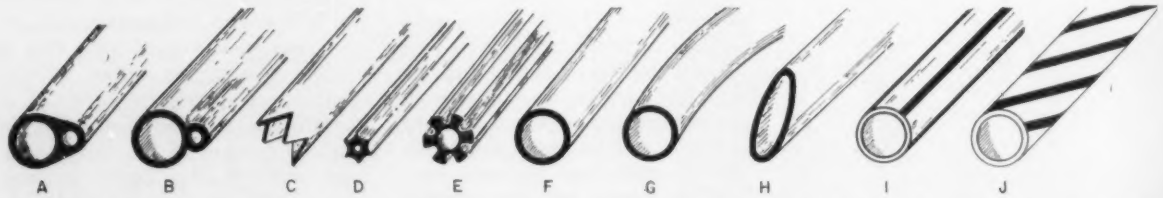
New developments

1. Increased use of food aerosols affects the choice of raw material for dip tubing. Recent F&DA regulations place definite restrictions on packaging materials in contact with foods. Several grades of polypropylene received F&DA approval in 1960. In June, 1961, the Commissioner of F&DA signed additive regulations listing specifications for polyethylenes. These permit use of many polyethylene and polyethylene-butene copolymers meeting the specifications. The specifications generally are not met at elevated temperatures but only at standard room temperatures. For elevated temperature use, F&DA granted an extension to permit development of more appropriate specifications.

2. The cosmetic industry, which took advantage of suitable plastic materials so aerosol tubes are virtually "invisible" in glass aerosols, may now take advantage of multicolor extrusion techniques to provide special effects in transparent containers. Striped and spiraled tubing are obtainable in two or more colors.

3. Advances in copolymerization techniques have resulted in more stress-crack-resistant base polyethylene resins for compounding. It is possible now to utilize higher-density and more-rigid polyethylenes for stress-crack-resistant applications. The original linear polyethylenes were quite unsuitable in critical end uses such as aerosol dip tubing.

* Anchor Plastics Co., Long Island City, N. Y.



AEROSOL TUBING cross-sections: A and B, with separate breather; C, pinked-cut round—for rapid discharge; D and E, fluted—external voids serve as breathers or vents; F and G, standard round—in straight lengths or with curvature; H, angle-cut round—to prevent bottoming or clogging of opening on convex can bottoms; I and J, striped and spiraled. (*Anchor Plastics drawings.*)

THE FIRST FAMILY OF AEROSOL CANS

bears the name Crown



Name the product you want to put in aerosol cans and Crown has the ideal container for your purpose.

For sensitive products or products that are hard to hold under high pressure, the Crown Spra-Tainers are the *only* seamless aerosol cans on the market. For other products, Crown produces the conventional fabricated aerosol can. Capacities are 6, 8, 12, 14, or 16 ounces.

Crown is the originator of the disposable aerosol can . . . the largest manufacturer of aerosol cans . . . with the widest variety of aerosol cans.

YOUR PACKAGING DESERVES CROWN QUALITY

cans • crowns • closures • machinery

CROWN CORK & SEAL CO., INC.

9300 Ashton Rd., Philadelphia 36, Pa.

Aerosol loading and filling*

While the customer is aware of the obvious points of difference between an aerosol and a conventional package, to the packager aerosols are unique in even more significant ways. Some of these are:

1. For the most part each package must go through a filling process twice—one for active material, the other for the pressurizing factor.

2. Accuracy of fill of each portion of the contents determines the functional performance of the package and indirectly the end efficiency of the active material.

3. Plant procedures can have an effect on the physical safety of the finished packages.

4. Proportions of ingredients can determine legal compliance and acceptability for shipment in interstate commerce.

5. With certain exceptions, each package must be tested for safety and functional quality at the actual time of manufacture.

6. Proper use of the end product is dependent on use of specific package components.

7. Packaging techniques can influence quality and shelf-life stability to a degree not present in any other type of liquid filling.

8. Containers as manufactured and prior to use are subject to compliance with Federal specifications in many cases—something nearly unheard of in most consumer-type packaging.

An aerosol package consists of the package components, active ingredients and the propellant. Our concern here is with the process that combines these three elements to form the finished package. In considering the production of this package, the container or other package components as they are delivered will not be considered, since these items are dealt with in accompanying articles.

The preparation of active material for aerosol packaging is no different than for any other type of packaging and for that reason will not be dealt with in any detail.

If the aerosol operation is physically separated from the other manufacturing facilities, it will be necessary to provide facilities for mixing and solvent handling. If, however, the aerosol installation is located close to facilities normally used for mixing and manufacturing, a method of pumping directly to the aerosol line can be used.

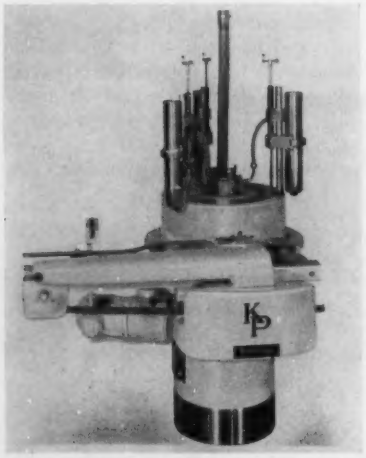
The wide variety of products and methods involved for various products makes it mandatory that each individual installation be custom tailored.

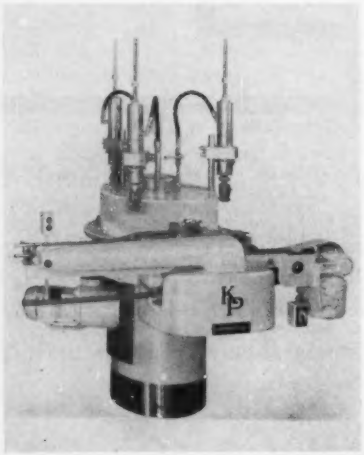
If foods or pharmaceuticals are to be a factor, bacteriological environmental control and means for sterilization and maintenance of chemically and biologically clean facilities will have to be provided. Proper storage of ingredients and finished concentrate frequently will require refrigerated coil coolers and refrigerated holding tanks—sometimes in a sealed system. Refrigerator rooms also may be necessary.

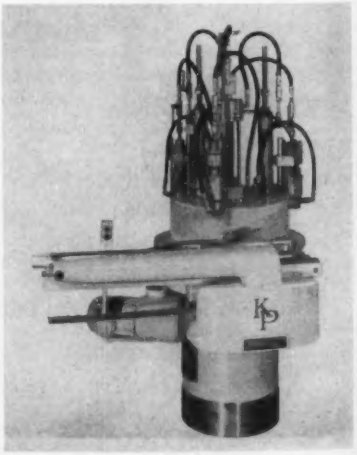
In all cases, provision must be made for holding concentrate until it is used up, without interfering with subsequent mixing operations which must go on while it is being used. This may mean bulk storage of concentrates, drawing off into 55-gal. drums, working reservoirs at the filling machine with enough volume to hold a complete batch, or duplication of final process tanking on the mix floor. Careful scheduling will make it possible to get along with minimum equipment; this is perfectly satisfactory, of course, as long as it is an adequate solution.

Obviously, all these considerations

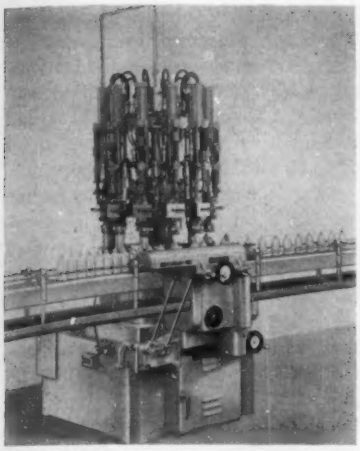
*This article based on information supplied by The Kartridg Pak Co., Mount Prospect, Ill.







IMPROVED STANDARDIZED EQUIPMENT available for aerosol loading and filling. More heads are available on these types of machines, for speeds up to 150 a minute. *First photo:* Three-head rotary product filler is for filling concentrates. Capacity is up to 16 oz. at speeds up to 60 a minute. *Second photo:* Three-head rotary through-the-valve gasser or through-the-valve button gasser is for liquefied propellants. Has capacity of 60 a minute. *Third photo:* Three-head rotary undercap gasser is for liquefied propellants. Capacity is 60 a minute independent of valve characteristics. (*Kartridg Pak photos*)



TWELVE-HEAD rotary through-the-valve gasser is for liquefied propellants. It has a capacity of 54 16-oz. fills a minute; accuracy of plus or minus 2.1 cc. For smaller fills, accuracy can be increased to plus or minus 0.3 cc., and the output to 200 a minute. (*Karl Kiefer photo*)

seldom apply to one operation, but pertinent ones must be chosen.

Propellant handling is a proper concern of this article. As outlined in the section on propellants, there are two broad groups—the liquefied gases and the compressed gases. The liquefied gases, of course, are further broken down into liquefied flammable hydrocarbons and liquefied nonflammable fluorocarbons. The compressed gases are separated into the strictly compressed gases such as nitrogen and the soluble gases such as carbon dioxide and nitrous oxide.

Help in laying out handling systems for the propellants will be available from the suppliers of all the gases, but here are some thoughts of interest.

Liquefied fluorocarbons are available from a number of suppliers under specific brand names. For the most part, practices applying to the shipping and handling of the gases are uniform. The commonly used propellants (P-11, P-12, P-22, P-113 and P-114) are available in 10-, 25-, 145-, and 2,000-lb. returnable deposit cylinders; also in tank trucks (usually 30,000 lbs.) and railroad tank cars (60,000 to 100,000 lbs.). Propellants 11, 12 and 114 are also available in 1- and 2-lb. disposable containers.

If production of very large quantities of aerosols is projected, it probably will be worth while to consider bulk storage of liquefied gas propellants. Prices of fluorocarbon propellants received by truck or railroad tank car are about a cent-and-a-half lower per pound than shipments received in deposit cylinders.

Offsetting these advantages are the relatively large investment for the storage facilities and the fact that, to handle a different blend or a different pure propellant in existing tanks, they must be emptied and vented to prevent contamination. This procedure can cause a real scheduling headache.

To avoid elaborate mixing and formulation installations necessary with bulk installations, in specific cases pre-mixed batches of propellant can be purchased from the propellant manufacturer. Special formulations which do not involve large production runs are handled more economically in the manufacturer-blended version than by attempting to accomplish on-the-spot blending.

The liquefied petroleum gases are available in a variety of shipping containers. Prices are lower in bulk lots, although the low price of these gases in general reduces the importance of this as compared to the fluorocarbons.

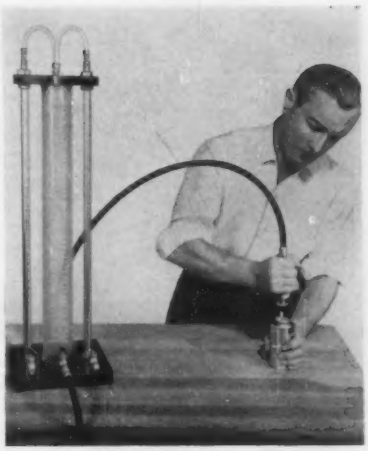
Compressed and soluble gases are usually delivered in small cylinders which are connected to manifold systems in use. The exception to this is nitrogen. It is economical under certain circumstances to handle this as liquid at minus 330 deg. F. and store it in properly lagged or underground open-vented tanks.

Since many aerosol formulas require a blend of two or more liquefied gas propellants, some provision must be made for either the necessary storage of all the mixtures used (and purchased as mixtures) or for the mixing of the propellants within the plant.

With container components, concentrate and propellant at hand, the process of combining them can then be considered. On a laboratory or a sample basis a finished aerosol of the liquefied gas propellant type requires:

1. Measurement of concentrate into the container.
2. Measurement of propellant into the container.
3. Application of the closure.

The above procedures can be accomplished with a hand cap clincher, a simple balance and a dollar's worth of dry ice. Concentrate is weighed into the can; the can and concentrate and a 1-lb. can of propellant are chilled with the dry ice; the propellant can is then opened and the requisite amount of propellant weighed into the can with the concentrate. A valved closure is then crimped into place.

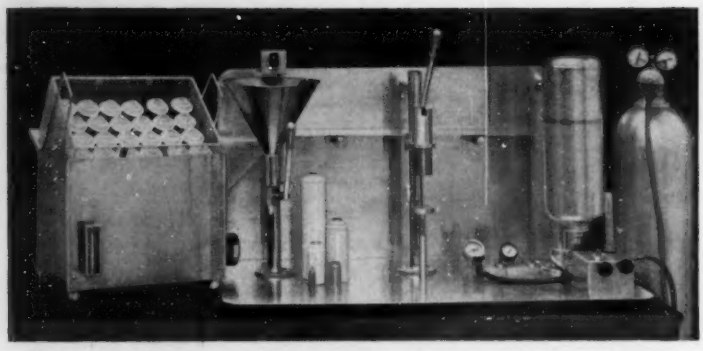


PORTABLE BURETTE for injecting the propellant into aerosol cans is easily set up for small-lot or laboratory work. The hand-operated injector has easily changed adaptors to most popular makes of valves. Operator is protected by a shield around the burette tube. (*Aerosol Machinery photo*)

On a commercial basis an aerosol packaging operation must provide for:

1. *Assembly* of package and contents into a pressurized unit.
2. *Functional testing*. This consists of a check of spray or other dispensing characteristics.
3. *Legal testing*. A 100% test of filled containers at 130 deg. F. (usually under water). Visual inspection for leaks, deformities, weak containers, valve failures, excess pressure, etc. Required of most but not all aerosols.
4. *Quality-control testing*. Continuous statistical sampling and testing to determine trends of machinery performance and changes necessary to insure product uniformity. Includes fill variation data by either weight check or fill level. Also the accumulation of samples for analysis of contents and specification compliance, and holdover shelf-storage samples.
5. *Finishing*. This consists of applying labels, overcaps, neck collars, etc., and cartoning.

An ideal universally adaptable production line might be made up as outlined below. It is apparent that such a line is more hypothetical than practical, for there would be considerable equipment unused and unusable during any particular production run. For this reason, of course, multiple, more or less specialized lines would be preferred to a single, universal line. Also, while food or pharmaceutical facilities



ECONOMY for low-run requirements in aerosol loading. The model is practical for custom filling of products such as cosmetics, drugs and paint. Unit has a combination fluorocarbon, nitrogen and CO_2 gasser, and includes an automatically controlled filler and a crimper. Drip, foam, powder, stream, spray, mist and metered valves are compatible with its operation. (*Pressure Pak photo*)

have been included, it is obvious that it would be impractical to handle these products in the same equipment used for furniture polish. It should be mentioned that the entire facility for foods or pharmaceuticals, including all equipment and the room itself, should be sterilizable and physically isolated from all other operations.

Hypothetical aerosol line:

Carton, bag or pallet unloader for containers (assembly)

Bottle pre-tester (assembly)

Container cleaner (assembly)

Container coder (assembly)

Ball agitator dropper—for paint, etc. (assembly)

Concentrate filler (assembly)

Recording X-ray fill level checker (quality control)

Valve inserter (assembly)

Rotary vacuum crimper for use with through-the-valve gassing (assembly)

Rotary through-the-valve gasser for liquefied gases (assembly)

Rotary agitator gasser for compressed and soluble gases (assembly)

Compressed gas pressure tester (quality control)

Valve button applicator (assembly)

Under-the-valve gasser for liquefied gases (assembly)

Spray test bench (functional test)

Hot-water bath (legal test)

Labeler (finishing)

Special finishing section (finishing)

Overcap applicator (finishing)

Carton set up, loader and sealer (finishing).

The above line could also utilize centralized speed control, unit interlocks and monitoring recorders for each station, alarms, signal lights, etc.

Such a line on a balanced high-production basis with all units automatic is not completely available at this writing, although the only deficiencies are in the accessory equipment such as valve inserters, button applicators, etc. These units are currently available but have not been refined to yield production levels as high as the more important items of equipment.

While the over-all operation of producing an aerosol package of the liquefied-gas propellant type involves a number of different techniques and pieces of equipment, the one question is "shall it be cold-fill or pressure-fill?"

From the theoretical standpoint the cold-fill approach always has been absurd. Heavy expenditures of power have been necessary to chill the container contents—both concentrate and propellant—to as low as minus 30 deg. F. Further heavy expenditures of power then have been needed to raise the temperature of the same package some 160 deg. F., for legal testing in the water bath. The waste of propellant caused by "flashing" as it is filled into the container has been a significant source of loss and, in the case of flammable gases, a safety hazard that simply cannot be defended. The cold-fill method appears to be outmoded as far as new installations are concerned.

Pressure (or room temperature) filling can be accomplished in two different ways. One way is to force the gas backward through the spray valve after the container closure is in place. The other way is to maintain the open container in a sealed environment so that liquid gas under pressure can be introduced before capping. Capping is then completed while the system is still under pressure.

Originally, all the pressure-gassing equipment was of the through-the-valve type. This, of course, meant that the speed of fill of an individual container was limited by the speed with which gas could be forced backward through a valve. A natural corollary of this condition was that pressure-gassing facilities tended to dictate that the valve with the best pressure-gassing characteristic would be used, rather than the one yielding the best dispensing of the product.

Initially all units were of the single-head variety with accompanying limitation in output—usually less than 20 per minute. Gradually the demand for more speed prompted major engineering developments. High-speed multiple-head pressure-gassing units of both rotary and straight-line type were made available and readily accepted by the industry. This trend has resulted in the recent installation of a number of rotary units with output capacity of over 100 containers per minute with a 16-oz. propellant fill.

These through-the-valve gassers will, most likely, always have application to some types of aerosols. Although the under-the-cap gassers (described later) will carry the main load of high-proportion fills of liquefied gases, the agitator gasser of the through-the-valve type probably will always be necessary for injection of soluble gases, and the through-the-valve gasser for liquefied gases undoubtedly will continue to be used for packages where small quantities of propellant are involved, such as in foams or for very small spray units.

High-speed rotary-closing machines have been developed to keep pace with the rotary gassers. They may be of the vacuum or nonvacuum type. The purpose of drawing a vacuum prior to capping is to remove as much air as possible from the head space of the container. This removes the possibility of compressed air adding to the internal pressure of the container. The propellant formulation used will give a predetermined pressure within the container if no air is present. In critical spray applications a variation in internal pressure of as little as 5 p.s.i. can deliver an unsatisfactory spray pattern. In the cold-fill method the "flashing" propellant displaces the air prior to capping.

The most recent innovation in the field of major aerosol equipment is the "under-the-cap" pressure gasser, perfected for cans and now in use. This machine combines a vacuum

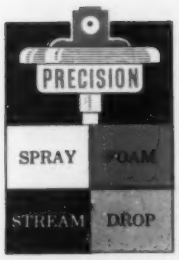


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crimper and pressure-gassing cylinder in one unit. A vacuum is drawn on the sealed-off, but uncapped, container, the propellant is introduced and the container is capped—all on one station of a continuously moving rotary machine. This machine is capable of 120 containers per minute with a 16-oz. propellant fill.

The under-the-cap gasser finally combines the advantages of both cold-filling—i.e., solid caps or any choice of valve can be used without regard to its pressure-filling characteristics; and pressure-filling—i.e., less power consumption, less propellant waste, smaller space requirements, better quality control, applicability to cold-sensitive concentrates, simpler maintenance.

With one exception, all the equipment listed for the hypothetical line falls into two broad categories. Either it is specifically limited to aerosol application, or it is completely general in its application. The exception is the concentrate filler.

Although filling the concentrate into aerosol containers is functionally no different from filling the same type material into any nonpressurized package, the matter of fill accuracy will have a direct bearing on the quality of the finished package.

The dispensing characteristics of an aerosol package are dependent to a great extent on the uniformity of proportions between the concentrate and the propellant, and the accuracy of the concentrate fill naturally will have a bearing on the variation in this proportion. In addition, in the case of very small fills of concentrate, the variation might become a significant percentage of the total concentrate—resulting in waste or, even worse, incorrect dosage where meter-dispensed pharmaceuticals are concerned. Since a given machine usually will vary in absolute units rather than percentage, the filler accuracy required will depend on the sizes of fill involved. For example, a liquid filler with a two-gram variation could fill a concentrate for a 16-oz. aerosol paint, but would prove to be totally inadequate for a 10-cc perfume or pharmaceutical package.

Outside of these considerations, the usual factors influencing a choice of filler can prevail. Gravity, vacuum, piston, constant flow-variable time, constant time-variable flow, and volumetric type filling will all work satisfactorily when applied to the right conditions. In addition to the conventional fillers, the suppliers of aerosol equipment have developed fillers for more or less specific application to the field.

An aggregation of units from the super-automated composite line previously described could be an ultimate answer to aerosol production, but it would not be, in any sense, the only answer or even the only efficient answer. Equipment must be balanced to needs and in many cases a semi-automatic or hand operation can be highly satisfactory. Equipment is available for all types of operation and for all levels of production.

This leads naturally to the expenditure levels required for various types of aerosol installations. Totally hand-operated equipment adequate for one or two units per minute is available in the $2,000 range. Power-driven manually operated equipment is available in the $4,000 range. Automatic medium-speed lines can be assembled for $18,000, and high to ultra-high for between $40,000 and $100,000. The sky is the limit as automation, control refinements or special characteristics are being incorporated into the facilities.

All aerosol equipment is more or less custom built, although perhaps to a standard design. For this reason it is well to give much thought to the purchase specifications which must be met. A complete and detailed understanding—right from the start—of what is being ordered on the part of the purchaser and what is to be delivered on the part of the supplier will save many a headache and perhaps a lot of money for both.

A very constructive procedure and one which is being insisted on by some equipment suppliers is the pre-shipment approval. This is an arrangement whereby the finished equipment is tested and approved under production conditions by the purchaser or his designated representative in the supplier's factory. This test will reveal weaknesses or failings in the equipment and also serves to familiarize the purchaser's employees with the operation of the machines. Required alteration, repairs or modifications can be made with a minimum of lost motion by the supplier, and purchaser is assured that equipment meets his specifications before it leaves the factory.



MAGNETIC UNITS solved the problem of filled aerosol cans falling and floating off underwater belt conveyor as they enter the heating bath. The nonelectric magnetic rails, in continuous section, are under the nonmagnetic steel belt. Cans are held and controlled securely; even small cans are readily handled. (*Eriez photo*)

Looking forward

Although improvement in all phases of aerosol technology must continue, there are a number of departures from current production practice that should be brought about. In addition, complete innovations will be necessary in some areas if the industry is to meet successfully the real challenge of the future.

Among the desirable developments for the future are:

1. Elimination of the water bath—accomplish its purpose automatically.
2. An automatic spray and foam quality test.
3. Automatic random sampling, combined with testing and recording of: ingredient proportions, water, air content, particle size, discharge rate.
4. Equipment to sterilize containers and handle them under sterile conditions until used.
5. Filling and gassing equipment that will maintain sterility.
6. Specialized heat-processing units for pressurized-food operations.
7. Under-the-valve filling for bottles and miniature metal containers.
8. Non-puck handling of bottles through the line.
9. Rapid method of determining true shelf-life expectancy.
10. Simplification of equipment through imaginative design.
11. Universal pressure test method for meter valves.

AEROSOL PROPELLANTS

The propellant in an aerosol product is the agent which provides the internal pressure that expels the active ingredient from its container when the valve is depressed. In addition, in products like insecticides, the propellant provides the "blasting" effect which (together with valve design) breaks up the active ingredient into fine spray particles.

Under the definition proposed by the aerosol division of the Chemical Specialties Mfrs. Assn., "aerosol" products are construed to mean those which use a liquefied gas as the pressure-producing agent. Compressed gases, such as air, nitrous oxide and carbon dioxide, also can be used as propellants. Choice of the last two in a food product such as whipped cream is based largely on their freedom from toxicity when inhaled or ingested.

Among liquefied gases, the most commonly used propellants are fluorinated hydrocarbons. These compounds have proved through continuing studies to be safe from an inhalation standpoint in even greater amounts than those encountered in conventional use of aerosol products. The studies have been made during the more than 30 years the compounds have been used as refrigerants in various types of cooling equipment.

Among the fluorinated hydrocarbons, trichloromonofluoromethane, dichlorodifluoromethane and dichlorotetrafluoroethane constitute the bulk of the propellants now in use. (See table, opposite page.) Others which are used in small amounts are trichlorotrifluoroethane, monochlorodifluoroethane and difluoroethane.

Liquefied-gas propellants other than the fluorinated hydrocarbons currently in use in aerosol products include methylene chloride, methyl chloride, vinyl chloride, n-butane, isobutane and propane. Methylene chloride is used to some extent, because of its solvent power, in combination with certain fluorinated hydrocarbons. Methyl chloride is limited to small numbers of high-pressure aerosol products, like insecticides and fungicides, for professional rather than amateur consumer use, so that adequate safeguards can be maintained against its higher toxicity, flammability and the like. The hydrocarbons are being used in increasing quantities, especially in water-based products where a foam is desired. Use has been spurred by the search for economy and by patent restrictions for certain soap-types of aerosols.

The compressed-gas propellants commonly used for aerosol applications are nitrous oxide, nitrogen, carbon dioxide and, in some cases, argon. The compressed propellant has many applications to the food and nonfood field because it is inert, low in cost, nontoxic, nonflammable, approved for food usage; also, there is no adverse effect on color or flavor when an appropriate propellant within the class is applied.

Nitrous oxide has been used for many years in the medical and food fields. The high standards of purity assure freedom from toxicity and possible adverse effects from either inhalation or ingestion. The higher solubility characteristics of nitrous oxide or carbon dioxide make either one a worthwhile and advantageous propelling medium for foam or spray applications. Nitrous oxide and/or carbon dioxide are used in food aerosols such as whipped creams, whipped toppings, etc. In nonfood aerosols, nitrous oxide and/or carbon dioxide are finding application as the propellant in wet-surface sprays—such as insecticides, household cleaners and polishes, and products in the automotive field.

The extreme inertness and low-solubility characteristics of nitrogen make it possible to dispense products in stream or ribbon form with no loss in color or product quality. Products with these qualities, currently on the market, are toothpaste, chocolate and

Properties of compressed gases for aerosols

	Nitrous oxide	*Carbon dioxide*	*Nitrogen*	*Argon*
Chemical symbol	N_2O	CO_2	N_2	A
Molecular weight	44.016	44.010	28.016	39.944
Color	None	None	None	None
Odor	None	None	None	None
Taste	Slight	None	None	None
Spec. gravity (Air = 1) 70 deg. F. 1 atm.	1.5297	1.5290	0.9670	1.380
Density lb. per cu. ft. 70 deg. F. 1 atm.	0.1148	0.1146	0.07247	0.1034
Spec. vol. cu. ft. per lb. 70 deg. F. 1 atm.	8.711	8.7291	13.80	9.671
Density sat'd vapor, lb. per cu. ft. 1 atm.	0.2809	0.1711	0.2878	0.3677
Normal boiling point deg. F.	−127.237	−109.17 (sublimes)	−320.454	−302.55
Latent heat of evaporation BTU per pound	161.78	246.6 (sublimes)	85.67	70.02
Critical pressure atmospheres, Abs.	71.7	72.92	33.49	47.996
Triple point pressure critical temp. deg. F.	+97.70	+88.41	−232.87	−188.43

Properties of liquefied-gas aerosol propellants*

	Most commonly used types				*Special types*			*Food type*[7]
	Trichloro-monofluoro-methane	*Dichloro-difluoro-methane*	*Dichloro-tetrafluoro-ethane*	*Methylene chloride*	*Methyl-chloride*	*Trichloro-trifluoro-ethane*	*Monochloro-difluoro-ethane*	*Octafluoro-cyclobutane*
Trademark	Freon-11[1] Genetron-11[2] Isotron-11[3] Ucon-11[4]	Freon-12 Genetron-12 Isotron-12 Ucon-12	Freon-114 Genetron-114 Isotron-114 Ucon-114			Freon-113 Genetron-113 Isotron-113 Ucon-113	Freon-142b Genetron-142b	Freon-C318
Chemical formula	CCl_3F	CCl_2F_2	$CClF_2—CClF_2$	CH_2Cl_2	CH_3Cl	$CCl_2F—CClF_2$	CH_3CClF_2	C_4F_8
Molecular weight	137.4	120.9	170.9	84.9	50.5	187.4	100.5	200.04
Boiling point at 1 atm., °F	74.8	−21.6	38.4	103.6	−23.7	117.6	15.4	21.1
Freezing point, °F	−168	−252	−137	−142.1	−97.6	−31	−203	−42.5
Vapor pressure, p.s.i.a 70°F	13.4	84.8	27.6	7.2	73.4	5.5	43.5	40.1
130°F	39.0	194.9	73.5	24.2	176.9	18.7	111.8	107.0
Liquid density, lbs./cu.ft. 70°F	92.7	82.6	91.6	82.4	57.3	98.3	69.8	94.5
130°F	87.6	74.5	84.9	79.0	53.0	93.2	64.1	
Liquid density, gms./cc 70°F	1.48	1.32	1.47	1.32	0.92	1.57	1.12	1.513
130°F	1.40	1.19	1.36	1.27	0.85	1.49	1.03	
Flammability	Nonflam.	Nonflam.	Nonflam.	Nonflam.	Flammable	Nonflam.	Flammable[6]	Nonflam.
Toxicity[5]	5A	6	6	4 to 5	4	4 to 5		Estimated in Group 6[8]
Effect on elastomers % increase in vol.								
Neoprene type	60	0	0	150	80	7		Slight
Buna N type	15	5	0	250	150	2		to
Natural rubber	90	15	5	140	100	60		none
Examples of uses	Insecticides, room deodorants, hair lacquers	Insecticides, deodorants, paints, shave creams, pharmaceuticals	Shaving creams, colognes anti-perspirants, powders, pharmaceuticals	Insecticides, paints	Professional-use sprays—greenhouses, farms, etc.	Special products	Personal products—anti-perspirants, colognes	In combination with compressed gases for food and other pressure-packed products

* Sources: The information in this table is derived from more comprehensive tables prepared by supplier companies.
1 "Freon" is the trademark for fluorinated hydrocarbons produced by E. I. du Pont de Nemours & Co. (Inc.).
2 "Genetron" is the trademark for fluorinated hydrocarbons produced by General Chemical Div. of Allied Chemical & Dye Corp.
3 "Isotron" is the trademark for fluorinated-chlorinated hydrocarbons produced by Pennsalt Chemicals Corp.
4 "Ucon" is the trademark for fluorinated hydrocarbons produced by Union Carbide Corp.
5 Underwriters' Laboratories grouping: group 6 no evident toxic effect: groups 5 and lower have progressively greater toxicity.
6 Flammability range is reported at 9 to 14.8% of the volume in air.
7 Application for F&DA acceptance pending.
8 UL rating not applicable for foods.

table syrups, and related pharmaceutical and food items.

The new liquefied gas known as "Freon-C318"* is a promising candidate as a food propellant, and is being considered in combination with nitrous oxide. It is tasteless, odorless and nonflammable. The compound, known chemically as octafluorocyclobutane, became available in development quantities in 1958 and, at the time of writing, Food & Drug administration acceptance was being sought.

*Du Pont trade name.

The one primary advantage that the liquefied propellant possesses over the compressed propellant is that it provides a uniform internal pressure throughout the use of the container. With the proper combination of product characteristics, valve actuator and propellant, it is commercially possible to dispense high percentages of the product and still remain well within the safety limits of the container.

The advantages that the compressed propellants possess are: (1) low cost; (2) no adverse temperature effect when applied to cutaneous surface, such as in a sun tan spray; and (3) ease of filling.

Choice of propellant is based on:

1. The dispensing characteristics desired.
   a. Pressure in the case of liquefied propellants in part determines the spray pattern achieved.
   b. Proper mechanical breakup by a valve actuator combined with pressure provides this control in a compressed gas aerosol.
2. General compatibility of the pro-

pellant with the product formulation and container.

3. Stability of the finished product.

4. Effect of the liquefied propellant upon the toxicity or flammability of the spray.

Pressure

As far as pressure is concerned, aerosol products packaged with either a compressed or liquefied propellant must conform with regulations of such agencies as the Interstate Commerce Commission, the Post Office Department, and other regulatory bodies such as local fire departments. Generally speaking, dispensing pressures for liquefied propellants must be below 40 p.s.i.g. at 70 deg. F. for the low-pressure aerosol container. Products having an internal pressure of 40 to 70 p.s.i.g. at 70 deg. F. must be packed in a specially designed metal container. Products packaged above these pressures must be packed in specially designed metal containers that will withstand twice the pressure of the contents at 70 deg. F. For example, food products packed in aerosol cans must not exceed 100 p.s.i.g. at 70 deg. F. or 135 p.s.i.g. at 130 deg. F.

Any desired pressure can be obtained with the fluorinated-hydrocarbon propellants which are commonly used today because each compound has its own unique vapor-pressure characteristics. Dichlorodifluoromethane, for example, provides a pressure of about 70 p.s.i.g. at 70 deg. F., while trichloromonofluoromethane has no positive gauge pressure at that temperature. A fifty-fifty mixture will provide an intermediate pressure. Although it has some solvent advantages, trichloromonofluoromethane essentially is used in propellants as a pressure depressant.

Dichlorotetrafluoroethane has a vapor pressure between dichlorodifluoromethane and trichloromonofluoromethane. It is used alone or with dichlorodifluoromethane in products such as perfume or cologne and also in products that are more viscous and/or subject to hydrolysis such as hand lotion and water-based products like shaving cream.

Pressure also can be controlled by varying the ratio of the propellant to the active ingredient, by means of the solvent. Many solvents produce changes in pressure that are close to those estimated from simple gas laws. Other solvents, such as alcohol, which are quite different in chemical nature from the fluorinated hydrocarbons, tend to produce solutions with pressures higher than might be expected. Pressures in excess of those expected from the propellant also may be due to air which is trapped during aerosol loading.

The composition of the propellant, as well as its concentration, determines the pressure of the formulation. This in turn controls the nature of the spray. Thus selection of the propellant plays an important part in determining spray character.

In products propelled with a compressed gas the spray is determined not by concentration and pressure of the propellant alone, but also by the attached mechanical breakup actuator. In the compressed gas product it is extremely difficult to obtain a misty spray, such as is observed in aerosols having a liquefied propellant of high concentration.

The mechanical breakup actuator when combined with the somewhat limited yet still useful expansion ratio of the soluble compressed propellant yields excellent spray characteristics. The mechanical breakup button is not used as widely in aerosol products propelled with liquefied propellants, except in those instances where low pressure relationships are applied.

The use of liquefied propellant for control of foam structure in shaving creams is well known. High propellant concentrations produce stiff, dry foams. Lower propellant concentrations give soft, somewhat wet foams.

Compatibility

The term compatibility includes questions of original solubility as well as changes in the physical condition of the formulation upon storage or as a result of temperature changes. In some cases, complete solution of all the materials of the formula may be needed, while in others only partial solubility may give a satisfactory product. In still others, such as water-based foam products like shaving cream, the active ingredient and propellant may be immiscible, each existing as a separate liquid phase within the container. The latter type of product requires shaking before use so that the immiscible propellant and the active ingredient will form an emulsion or dispersion of one in the other.

Compatibility may change quite rapidly with temperature, so the choice of a propellant must be based upon tests of the formulation over a wide temperature range representing actual storage and use conditions. Miscibility of the ingredients in the concentrate also is important at low temperature to assure a uniform product during cold-loading.

Sometimes the active ingredients will be only partially soluble in the propellant. In such cases, an auxiliary solvent, such as methylene chloride for paints and enamels or alcohol for perfumes, must be added.

The problem of compatibility in the compressed-gas aerosol is a minor one. Use a high-solubility propellant for a foam or spray and a low-solubility propellant for a nonaerated stream or spray.

Flammability, toxicity, stability

The most commonly used fluorinated-hydrocarbon propellants are nonflammable in themselves and will not support combustion. However, because of the varying nature of active ingredients and solvents, they do not guarantee nonflammability of the finished aerosol formulation. Isobutane, of course, is flammable.

Flammability of an aerosol product is checked by such means as the flame projection test, modified Tagliabue open-cup test, and open- and closed-drum tests. Full information on these tests can be obtained from the Chemical Specialties Mfrs. Assn., the ICC or the Bureau of Explosives.

Toxicity of finished aerosol formulations is an important consideration. The fluorinated propellants have a very low degree of toxicity and this is a major reason for their wide use. In the table on page 404, the relative safety of the various compounds, as far as inhalation is concerned, is indicated by the Underwriters' Laboratories' system of comparison.

A satisfactory aerosol product is one in which the active ingredient undergoes no change during normal shelf storage and use period.

Sound storage tests, in advance of formal marketing, can detect potential problems, such as corrosion, valve malfunction and gasket leakage.

Because the commonly used aerosol propellants boil at temperatures below room temperature, they must be handled and stored in pressure containers or in refrigerated equipment which will keep them in a liquid state by cooling them below boiling point.

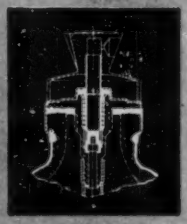
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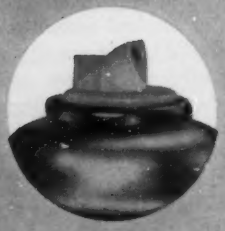




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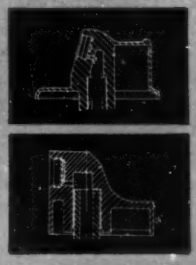
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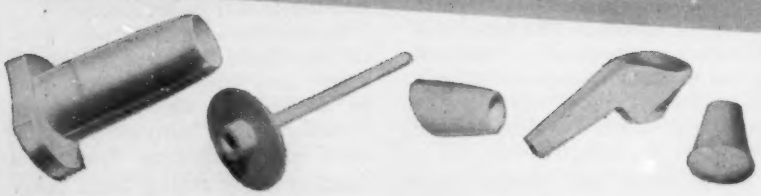
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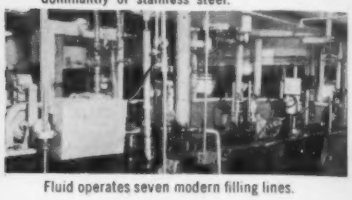
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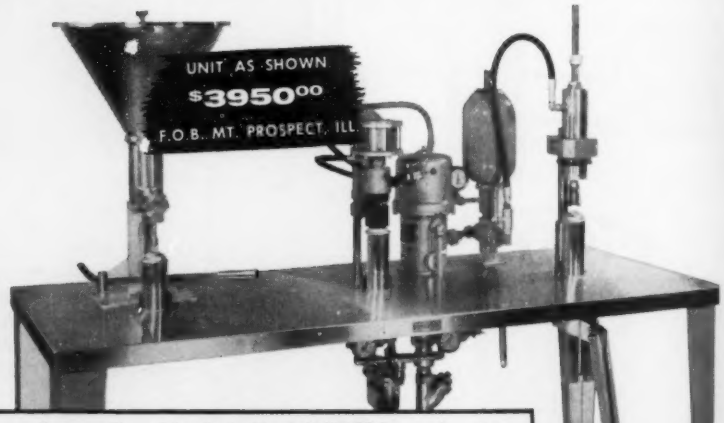
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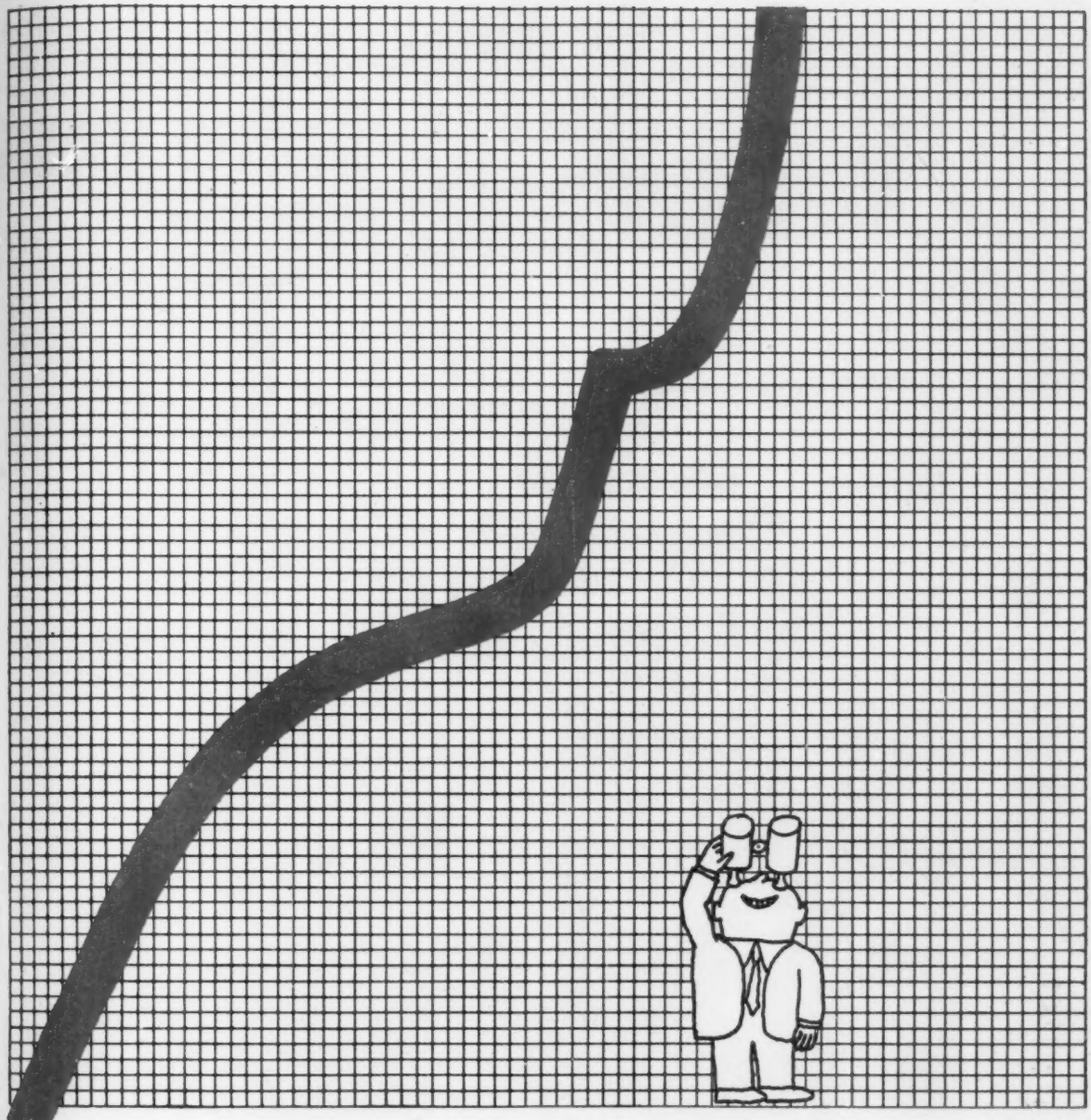
Shown above: Kartridg Pak Model KP500 semi-automatic aerosol line. Unit includes product filler, can crimper, pressure filler, accumulator and propellant pump.

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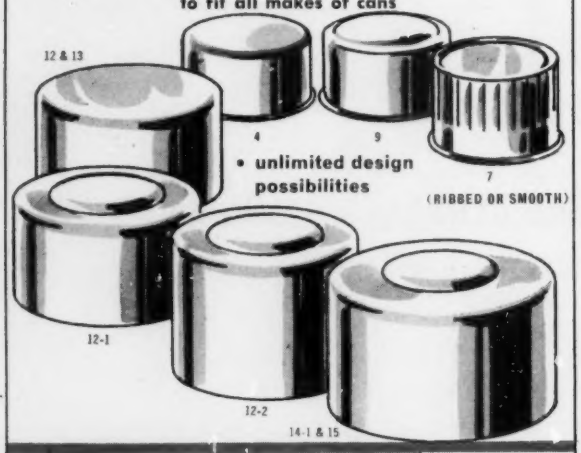
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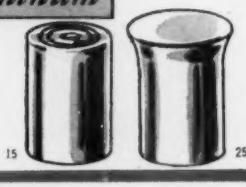


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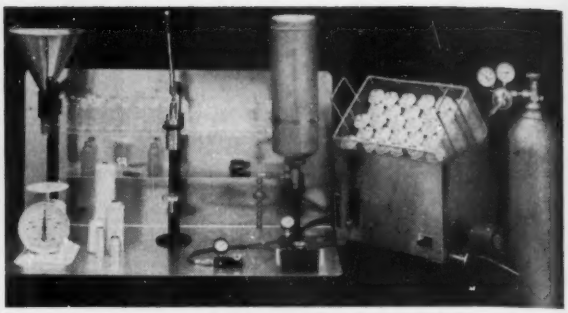
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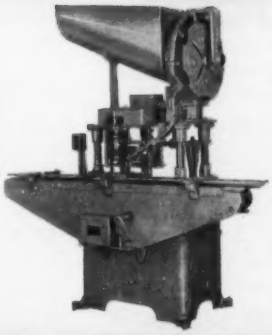
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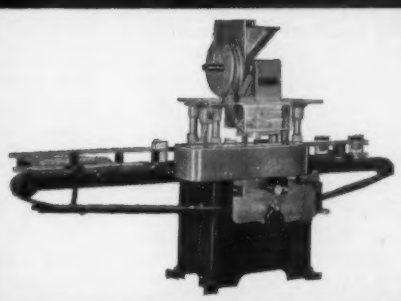
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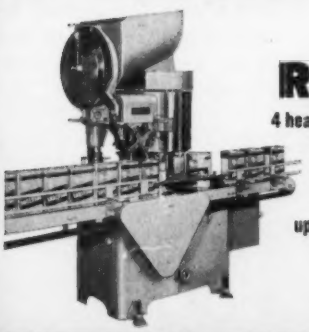
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SECTION 12

MACHINERY FOR THE PACKAGING LINE

FILLING DRY PRODUCTS

by Samuel T. Brinton*

Today practically every product is packaged—for protection, convenience, greater appeal at point-of-purchase, and more impulse sales.

But with progress have come problems. If yesterday's sugar refiner packed a barrel of sugar in 10 minutes, today he must package the equivalent of two barrels in half the time—not in barrels but perhaps individual-service pouch packages which increase unit numbers by thousands.

In addition, all costs continue to mount, and combating this is a major concern. In many ways the solutions are essentially analogous to the methods used in other production functions: increased efficiency, reduced handling, automation, mechanization, and the like. This means more and better machinery must be developed, and that is being done.

Take automation. Today one can buy a fully automatic line that starts with a flexographic printing press tied in with machinery to form, fill, check weigh and close the package. Then the package is conveyed mechanically to a caser which accumulates, positions, loads, glues and seals the case, moving it finally to an automatic palletizer. It might be called the epitome of automated packaging.

But with the many advancements in techniques and methods, a concomitant problem arises. And it is filling accuracy—how to get as nearly the exact amount in a particular container as is expeditiously possible. Filling accuracy is inseparably allied with these advancements because the final choice is almost invariably a compromise between speed and accuracy. Maximum speed *and* optimum comitant problem arises. And it is virtually impossible to achieve.

Several reasons exist for putting filling accuracy at the top of the list:

Government concern. The F&DA is just one agency devoting more time and effort toward tighter legislation regarding weight control.

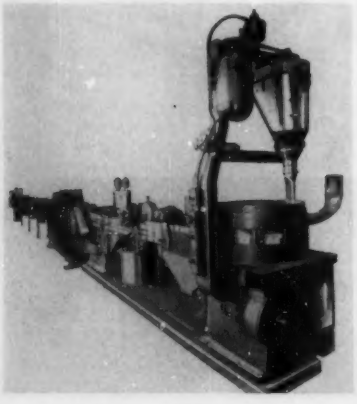
Customer good will. The housewife who discovers an underweight package quite naturally feels cheated. Even if small, the offense is a blemish on the manufacturer's reputation.

Material costs. Although the packager wants to, and must, satisfy the housewife, he doesn't want to overfill or give away any more than is necessary. In large operation or small, filling accuracy is important. (See also article on scales in Section 13.)

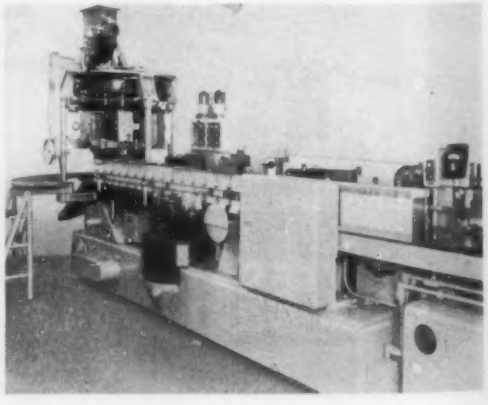
Faster speeds. As pointed out, when production speeds are increased the *total* amount of overfill increases as expected. But one of the vagaries with most types of packaging machines is that filling accuracy tends to decrease as speed is increased. So, the total amount of overfill *per package* also increases. The end result is a geometric rather than a straight arithmetical progression.

What then does this portend for the future? For one thing, probably more widespread use of check weighing. Completely automatic checkweighing machines now are available. Some are capable of speeds up to 400 a minute, weighing each package, then diverting "off weights" out of the production line. Some can be equipped with memory circuits and

*Sales Manager, Packaging Machinery, FMC Corp., Stokes & Smith Plant, Phila., Pa.



HIGH SPEEDS, to 400 a min., attained with new system using mechanical screw principle of auger filling. Fills cartons with many non-free-flowing products which tend to bridge or pack; seals cartons. *(FMC Corp. photo)*



COMBINATION machine is fully automatic. Feeds and sets up carton, seals bottom, fills, closes top, — in continuous motion — up to 200 a minute. Uses either volumetric measuring heads or net weighing heads. *(Pneumatic Scale photo)*

feedback devices to adjust automatically the filling machine—based on averages collected.

Another trend which could be developing is a decreasing dependence on net-weighing systems for high-speed operations. For products with varying densities, net weighing has no peer. But, as with other methods, it has shortcomings. Scales must be checked, serviced and recalibrated periodically and they have a definite speed limitation above which accuracy is not consistent. Whereas a volumetric system is simpler and usually more dependable, it likewise has shortcomings, particularly with products of varying density. However, this drawback may be removed. Beta Ray gauging devices were developed to detect density variation with extreme accuracies and produce usable signals by which automatic controls for volumetric filling can be actuated. If perfected, this could be a boon to high-speed packaging of free-flowing and non-free-flowing powders and granular products.

For fine, powdery products there have been advancements in getting more uniform packing densities. Some of these have been by the use of vacuum-filling devices, which will be discussed later. But most vacuum-filling methods completely fill the container and this is used as the measure for the amount filled. Thus, if the volume varies, as in the case of glass jars, the net weight of product filled will vary accordingly. New devices now are becoming available for vacuum filling of pre-set volumes of cavities in the filling machine. The cavities then are emptied into the container.

Another new technique to take advantage of high-speed volumetric powder filling is the use of a constantly rotating auger to produce a continuous stream of product. Revolving funnels slicing through the stream divide it uniformly and deposit the unit quantities in the packages. When the product filled by this method is known to have a uniform particle size, and its density varies primarily because of differing quantities of entrained air, the air can be squeezed out by applying some back pressure against the auger. Excellent accuracies have been achieved in early tests of this system.

These are the problems and a few of the attempts to meet them. But what about now? The chart on p. 431 indicates the wide variety of models and types available. It will be noted that certain basic principles of filling are involved, including volumetric, weighing and count.

Volumetric filling methods

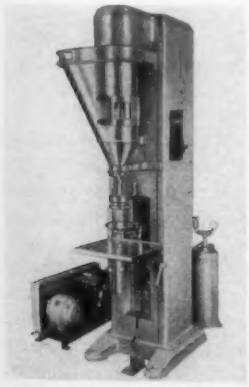
Pockets and metering devices. The simplest and lowest-cost equipment fills by volumetric measurement. Such machines usually are most suitable for free-flowing types of products. They are of various types.

A typical volumetric filler probably would have a rotating plate containing a number of pockets or circular openings above a stationary plate, which has a single outlet through which the product drops as the rotating pockets line up with the opening below it. Such machines usually are fed from a simple hopper arrangement. The pockets are filled level by means of a scraper or brush device. Most such machines are made with telescopic pockets so the volume can be adjusted quickly.

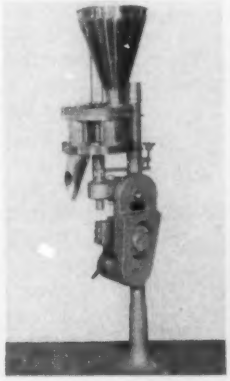
Actually, the term "volumetric" can be applied to any filling method where actual weighing does not occur. For example, a vibrator can be used to provide a uniform stream of product with the flow from the vibrator controlled by a timing device to make an intermittent delivery of product into successive containers. Or the vibration can be continuous, providing a uniformly flowing stream which then would be equally divided by evenly spaced and timed containers passing under or through this stream. Filling by these methods usually results in a loose fill in the container, unless the filled package is then vibrated to settle the product.

Augers, or screw-type feeders, represent another volumetric-filling method and usually are employed for conveying a non-free-flowing material from a hopper or material reservoir into a container. The auger itself usually is mounted vertically above the container, driven and controlled by a clutch and brake arrangement to start and stop the auger quickly. When the filling cycle is initiated, the auger rotates and drives the product into the container. As soon as the required amount of material has been delivered, the auger is stopped automatically and instantly by a brake arrangement at the same time the clutch is disengaged. Mechanical, electrical and pneumatic clutches are being used and each has advantages.

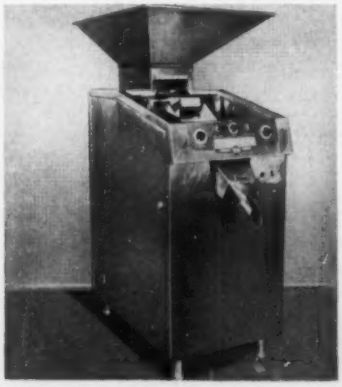
Various types of augers are commonly used. For example, there is a straight auger which has the same diameter over the entire length, and the tapered tip auger which, as the



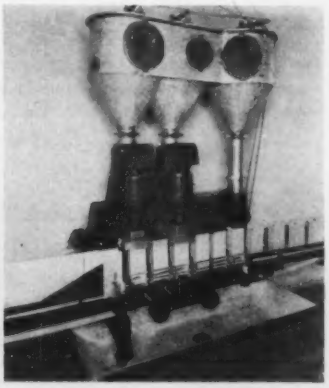
SEMI-automatic vacuum filler has auger mechanism. (*FMC Corp. photo*)



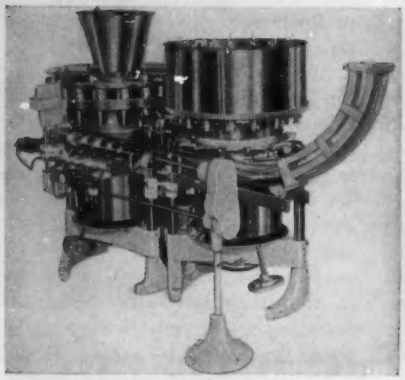
COMPACT volumetric filler saves floor space. (*Frazier & Son photo*)



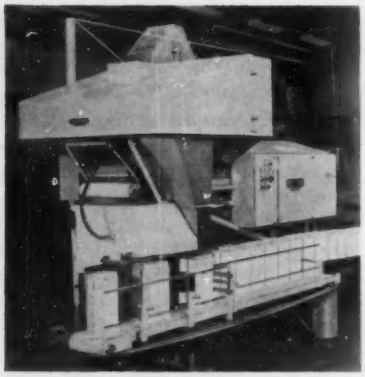
CHANGE-OVER in minutes is feature of "junior" net weigher. (*Wright Machinery Co. photo*)



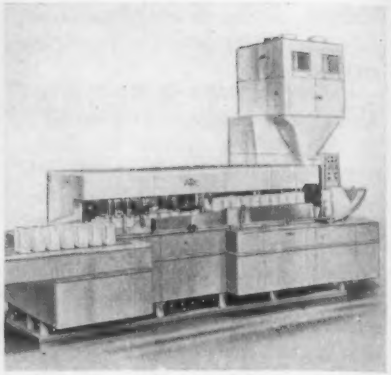
THREE STATION gross weigher handles packages at higher speeds. (*Pneumatic Scale photo*)



FIFTEEN-STATION filler is for free-flowing granular products needing addition of brine or sauce. (*FMC Corp. photo*)



PRECISION AT HIGH SPEEDS is the specialized feature of this net weigher. (*Olofsson photo*)



FLOUR packer fills 5-lb. bags at 22 to 28 a min.; handles 1- to 5-lb. bags. Models are 2- and 3-scale. (*Arenco Machine photo*)

name implies, is tapered in diameter for a portion of the lower end. The style of auger required is determined by the characteristics of the product to be handled and also the container.

Almost any powdered, granular, either non-free-flowing or free-flowing material, and certain semisolids may be handled by auger-filling methods. A tremendously wide variety of materials is packaged in a similarly wide variety of containers—tightly packed, or loosely filled.

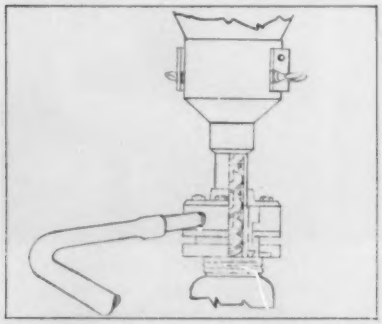
Taking the latter first, "loose volumetric filling" usually is done by controlling the number of revolutions of the auger which is predetermined and accomplished by a timing mechanism arranged to start and stop the auger. In this method, the degree of accuracy depends greatly on the constant density of the product handled and on efficient functioning of timing mechanism and clutch.

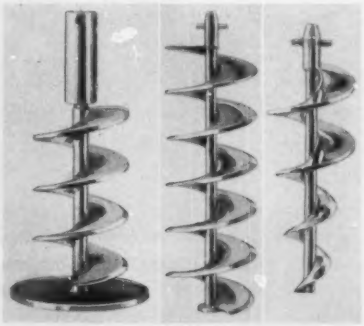
In "pack filling" of powders or pastes, the empty container usually is positioned on a vertically compensating platform, which is adjusted to impart a predetermined and constant upward pressure against the product as it is being forced by the auger into the container. The container is positioned so the auger starts filling near the bottom of the container and continues to fill and depress the platform until the fill of material reaches a predetermined height in the container. Then a tripping arrangement stops the auger. Again, since the amount of fill is controlled by the volumetric displacement, the accuracy of fill is greatly dependent on uniform capacity of the container and also on the uniform density of the product. For this reason, cylindrical containers with wide openings can be pack filled more accurately than square ones or those with restricted openings.

Auger feeders also are used with both net- and gross-weighing fillers.

In addition to non-free-flowing materials, free-flowing products also can be handled with augers, or centrifugal feeders combined with augers. In this application the product is fed by the auger onto an attached plate and then spun-off into the discharge funnel which directs the material into the container. When the auger stops rotating, the material comes to rest on the plate, which is so designed that the material, by its angle of repose, will not overrun the plate. This makes it possible to feed very free-flowing materials without any "drip" between containers, resulting in a clean but loose fill.

AUGER FILLING. *First* (cut-away view): combination auger and vacuum filling head for vacuum filling air-tight containers. *Second:* auger with centrifugal feeder, for non-free-flowing products. *Third:* straight auger, for non-free-flowing powdered products. *Fourth:* taper-tip auger, tapered at bottom for compacting powder to prevent drip when auger is not rotating. (*FMC Corp. drawing and photos*)





Vacuum filling

Another volumetric method is that of filling by vacuum into airtight containers. High-speed and dust-free performance are the strong points of the vacuum-type powder-filling machine. Therefore, it is especially recommended where fast, pack filling (as compared to loose filling) is required and a clean, neat operation is desired. Speeds up to 300 a minute are commonplace. The high speeds achieved with the vacuum filler are possible through a combination of (1) multiple heads, (2) rotary construction, (3) volumetric determination of the quantity of product to be filled and (4) utilization of vacuum to create flow rates higher than would be practical with just an auger or gravity.

Weight accuracy, however, is subject to several variables: characteristics of the powder, the container, and atmosphere of the packing room. Powder characteristics such as specific gravity and apparent density, homogeneity, flow characteristics and compacting also affect accuracy.

In vacuum filling, the internal vol-

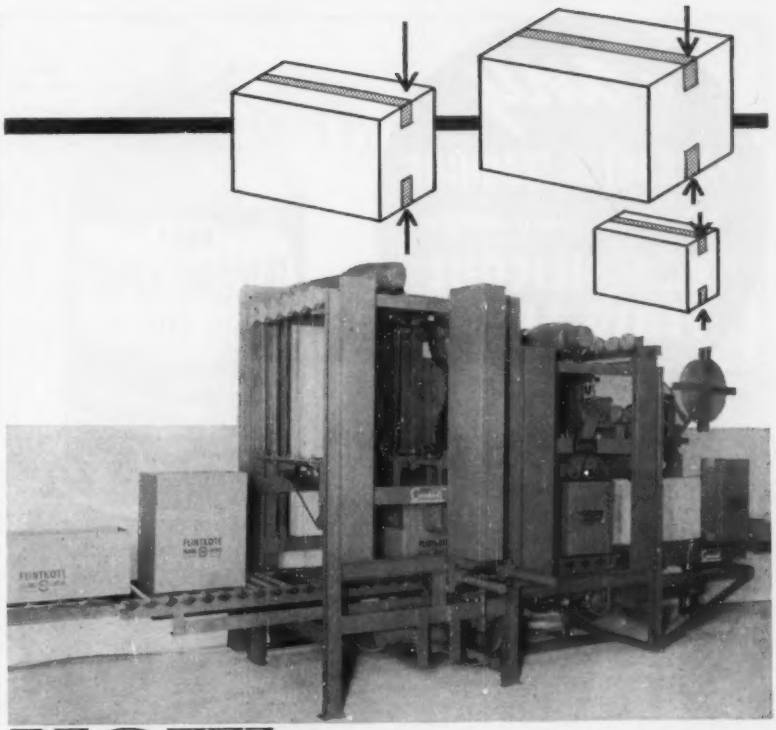
ume of the container determines the amount filled at any one vacuum setting. Tin cans, for instance, have a much more accurate internal volume than glass containers and, therefore, can be filled by the vacuum method providing the can has enough mouth to accommodate the filling nozzle and screens, and can be effectively sealed to the head of the machine. The atmosphere of the filling room is important, too, especially with respect to relative humidity. To avoid compacting, relative humidity should be maintained as close as possible to the powder's equilibrium relative humidity. If a wider variety of products has to be handled, an auger can be combined with a vacuum fill.

In operation the container is placed against a gasket surrounding the filling head and held in place by a lift-plate. The container is then evacuated and the product filled in by means of a vacuum (sometimes assisted by an auger). As the air in the incoming powder expands in the reduced atmosphere, the powder is distributed evenly. So much so, in fact, that a wide-bodied container can be filled through a relatively small neck without leaving a repose angle in the powder body. Evacuated air is drawn out through a fine mesh screen in the filling head. Containers such as canisters and some thin-walled tin cans, which might be damaged by pressure differential, are protected by a shroud. Sealing of the shroud to the lift-plate permits a simultaneous vacuum to be drawn on both outside and inside of the container—equalizing the pressure.

On some machines, by alternating the suction lines several times during the filling cycle, blow-back keeps the screens clear. In all cases the vacuum is broken-back at the end of the cycle, with atmosphere or with inert gas to clear off the screens for the start of the next fill. Following the breaking of the vacuum, the lifting plate lowers and the container is automatically or manually replaced on the conveyor line.

Net and gross weight filling

There are two types of weighers: *Net weighers* first weigh the product and then fill the weighed charge into the package. This method generally is used for free-flowing products with containers that vary in tare weight. Also, these weighers are more practical for flexible packages or bags since it is difficult to support a filled



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bag on a scale, particularly at high speed. Normally, however, net weighers cannot be expected to handle efficiently products that require a large amount of settling, compression or elaborate feeding devices. Products such as confectioners sugar, cake and pie crust mixes, brown sugar, and the like, because they are usually sticky, cannot be depended on to drop cleanly from net-weight buckets.

Gross weighers, on the other hand, weigh the product in the package; thus, the tare weight of the container is included. They are designed to handle the products mentioned above which require a large amount of settling, compression, or elaborate feeding devices. Since gross weighing feeds the product directly into the package, it can result in more gentle handling of the product.

Both net weighers and gross weighers usually combine a bulk fill with a dribble fill, since the cut-off of the small dribble feed is more accurate than the cut-off of a large amount of product. A relatively new net weigher now available reverses this arrangement and actually overfills the weighing buckets—then vibrates off the excess. Thus, any variation in weight caused by a disparity in the stream from the dribble feeder is eliminated.

The major types of scales used in packaging machinery are balances, spring scales, air balance and liquid displacement scales.

A balance scale usually consists of a beam with a weight on one end which counterbalances the weight of the product plus the tare weight of the package on the other end. In a spring scale the product plus the tare weight of the weighing receptacle (the gross weight of the package) is supported by the deflection of the spring. The air balance employs a jet of air pressure in determining a state of balance. In a liquid-displacement scale, the buoyant force of the displaced liquid supports the product plus the tare weight of the weighing receptacle. With these types, the scale generates a signal to stop filling action when desired weight of the material is received in the weighing receptacle.

Most weighing devices are limited in the number of weighing cycles they can perform per minute. Usually about 15 to 20 per minute per scale is maximum. Consequently, multiple weighing heads are required for high-speed operation. For this reason, high-speed machines using a weighing

method are usually much more elaborate and expensive to buy and maintain than volumetric machines. Net-weight filling still remains the most accurate, however, on large-size packages, particularly where product density is not uniform. Thus, when unit value of the product is high or precise quantities are otherwise demanded, net weighing may be required.

Filling by count

Another filling method for dry products employs a counting device. It is used for pills, tablets, capsules, pieces of candy, chewing gum, small hardware items and the like. Various counting methods are employed. (See article on counting machines, p. 446.)

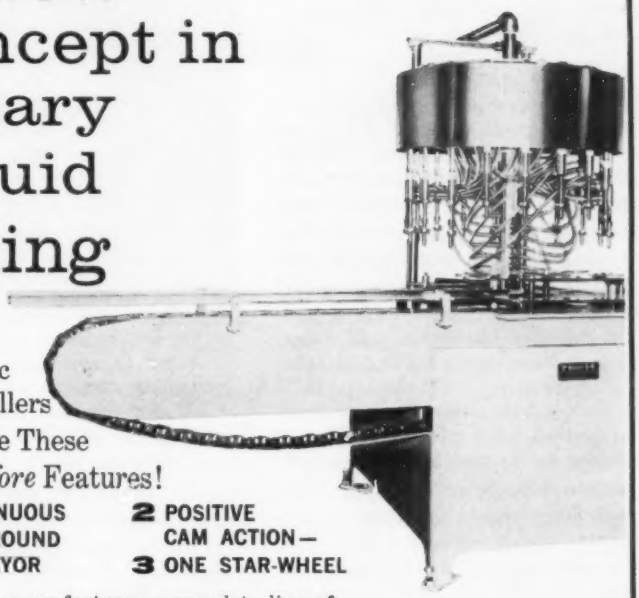
Selecting a filler

Confronted with so many possibilities, what's the packager's best approach to buying a piece of packaging equipment—or installing a new line?

The ramifications are almost endless. However, the packager can reduce the problem to manageable limits if he studies his product and package to determine which characteristics and requirements are most critical in determining a choice. Some of the considerations are:

1. Changes of density of the product—caused by varying particle size in homogeneous mixtures
2. Density changes due to pick up or loss of moisture or aeration or de-aeration in handling of product
3. Intermittent operations which cause the product to compact and thus change in density
4. Control of vibration in the handling of the product
5. Head pressure—variations in the amount of the product in the hopper.
6. Changes in the flow characteristics of the product
7. Size and shape of the container
8. Conditions of storage
9. Operating conditions – physical and human
10. Compacting of products caused by changes in pressure, such as in a hopper, which will change the flow characteristics and apparent density
11. Variation in the capacity of containers, such as glass jars or cans, where they are the unit of measure, or variations in tare weights of jars, etc., when gross weighing
12. Packing room humidity
13. Skill or dexterity of the operator, particularly in semi-automatic operations.

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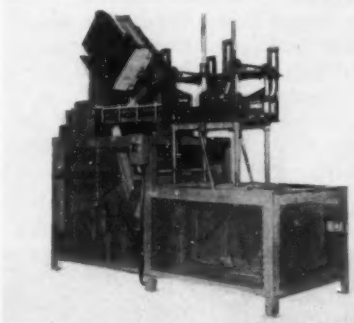
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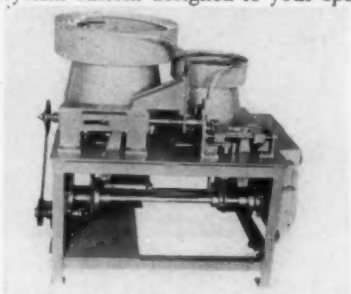


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Filling liquid products

by W. H. Bulcao*

Liquid-filling equipment has been enjoying much progress during recent years. Among the important developments are production increases, smoother and more efficient container handling and increased use of electronic safety and inspection devices. Also there are many ingenious special developments for nonaeration of product, nitrogen blanketing, cold filling, aerosol filling and handling of semirigid containers.[1] (See chart, p. 431).

During this period the maximum production speed of liquid fillers increased far beyond other comparable periods since automatic liquid fillers were first designed. For example, production speeds are now available for 250 whiskey bottles (4/5 size) per min., 700 cans of juice (6-oz.) per min., 600 quarts of lubricating oil per min., 700 bottles of ketchup (14-oz.) per min., 1,000 baby-food cans per minute.

During coming years, in addition to increased speed which obviously will always be a prime factor in all packaging, one trend in design change will be toward sanitary filling, particularly in the food and drug industries, or for any product for human consumption. By sanitary filling we mean design of filling valves and machines to conform to the type of regulations already in existence for the dairy industry. Eventually the standards now set up for the dairy industry will be extended to cover all products for human consumption and new design will be governed accordingly.

Electronic product inspection devices, while not always necessarily part of the filler itself, will also become more and more a factor—particularly in plants that are quality control conscious. Electronic checking of product fill height in nontransparent containers at high speeds is a practical addition to the line.

There also is a trend in some industries toward synchronization of all machines in the production line, particularly in glass container handling. There are definite advantages and disadvantages to synchronization which any potential user must fully investigate in relation to his products, containers and speeds.

Following is a brief summary of the main points to keep in mind when selecting a filler.

Product characteristics. This is one of the most important factors because product and container determine whether you are limited to one type of filler as best for your application.

Production speed is of prime importance because the machine must operate efficiently at the speeds desired by the user to coordinate with the entire line speed. When possible, a filler should have a production margin of 25% over maximum requirements estimated at the time of purchase.

Type of container. Generally speaking, there are three types of container materials—glass, metal and plastic. A filler which is best suited for glass might not be as efficient for tin or plastic and in some cases might not be able to handle tin or plastic at all. This factor is of utmost importance to the customer who in the future may want to run tin or plastic containers on a filler originally purchased for glass. The size and shape of container must also be considered. For example, some fillers cannot handle rectangular or odd-shaped containers efficiently. And some fillers cannot handle sprinkler-type containers at all. The type and shape of container, then, may dictate the use of a specific filler.

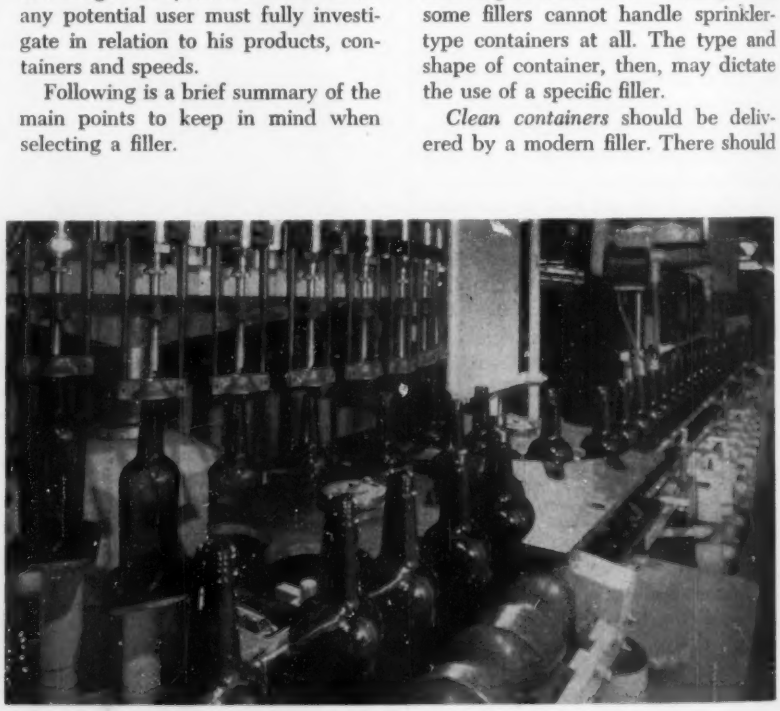
Clean containers should be delivered by a modern filler. There should

* Chief Engineer, Horix Mfg. Co., Pittsburgh, Pa.

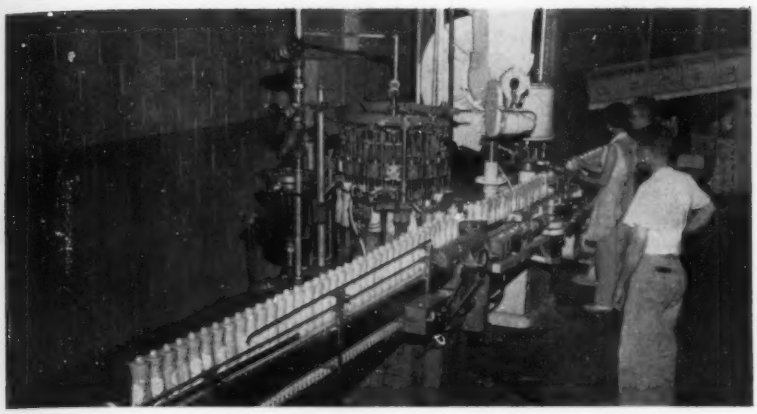
1 See MODERN PACKAGING articles: "New Speed for Big Bottles," Feb., 1961, p. 96; "Synchronous Line for Plastic Bottles," Feb., 1961, p. 110; "Bottling Whiskey 50% Faster," Jan., 1961, p. 98; "Tilt-Fill to Cut Foaming," Feb., 1960, p. 108; "High Speed for Plastic Bottles," Dec., 1959, p. 112; "Improved Liquid Filling," June, 1959, p. 136; "No-Contact Glass Lines," Jan., 1959, p. 90.



BELOW-SURFACE fill. Valve drops to bottom, retracts as fill is made; liquid port always below liquid surface. *(Horix photo)*



ADJUSTABLE fill height without stopping operation is feature of unit in high-speed bottling line. Filler has 40 heads and a special vernier-actuated cam rail that can be adjusted to control fill while machine is running. *(Pneumatic Scale photo)*



CONSTANT-LEVEL filler fills detergent into bottles. Gentle handling avoids pressure on bottle; deformation and bulging of bottle are prevented and accurate fill assured. Unit is installed at Tidy House to fill liquid Shina Dish. (*Karl Kiefer photo*)

be no spill at the speeds required and no product from the filling valves should come in contact with the outside of container.

Efficient container handling. Essentially, efficient container handling means feeding and discharging containers with feed screws at the speeds required with a minimum of fracture when glass is being handled and without bending or marring containers when metal or plastic is being handled. All necessary safety devices to suit the containers should be part of either the filler or accessories. Included in these devices there should be "no-container–no-fill" control, automatic stop at discharge for choke neck (glass), safety push rods (collapsible), back-up safety to stop filler if containers back up from infeed of capper to discharge of filler, guides on filling valves or container rests to center containers.

Cleaning and maintenance. Some types of fillers are much more readily cleaned than others. This is especially important in food packaging where it is necessary to clean the fillers daily.

The adjustment of fillers from one container to another may be a comparatively simple or comparatively difficult operation. Some fillers require considerably more time than others for conversion from one container to another. It is also important to determine whether or not a skilled mechanic is required to adjust and lubricate the filler or if the adjustment and lubrication system is designed simply enough so that any ordinary operator can perform this duty.

The maintenance life of the filler is also of prime importance. In other words, will it be necessary to rebuild the filler every two years or only every five to six years for maximum efficiency? The basic design of the filler should be looked into very thoroughly. The upkeep and parts costs on a lower-priced machine may more than offset the initial higher cost of another type of filler over a short period of years.

Flexibility. When two or more products are contemplated or there is a possibility of filling both narrow and wide mouth containers or both tin and glass, this factor should be thoroughly checked. Some fillers are adaptable to filling both wide and narrow mouth containers, and can handle glass, tin or plastic; others handle only one type of container and product.

Corrosion. When the product to be filled has corrosive properties, make certain that the general design, particularly the filling valve design, lends itself to handling this type of product. Contact materials must be appropriate and there are times when they must be nonmetallic.

Foaming. A great number of products tend to foam. Some types of fillers increase the natural foaming characteristics of the product while others minimize this action. Flow of liquid directed to the side of the container reduces tendency to foam, and bottom filling now is widely used for that purpose.

Under-surface filling which starts out as bottom filling–with the filling-valve liquid flow rising as the liquid level rises but always kept below liquid level–is one of the latest types of bottom filling for minimizing foam.

There also is a trend to the use of silicones and other defoaming agents, now available in nontoxic forms. Obviously these cannot be employed in some applications, but they are used successfully with products where formerly their use would not have been considered possible.

Oxygen pickup. If the inclusion of air is injurious to the product being filled or affects the appearance of the product sales-wise, then extra care should be taken in the selection of the right filler. Some types cannot fill without considerable aeration or oxygen pickup. There are also special fillers to handle products in this category.

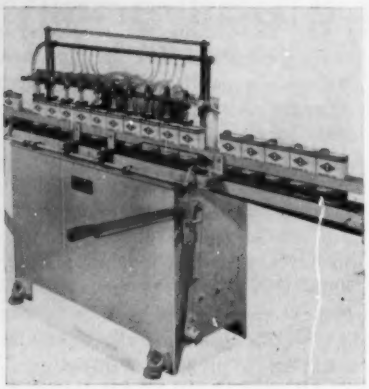
Accuracy of fill. In many operations, the container is used as a measure. Container volume accuracy thus becomes extremely important for products requiring fill accuracy. Some products–such as perfumes that are relatively high in value or antibiotics that have critical dosage levels–demand absolute accuracy. In such cases a filler that does not use the container as a measure is recommended.

Liquid fillers, for containers under 38 mm. opening, can be divided into six groups: gravity, gravity-vacuum, pressure-gravity, vacuum, pressure-vacuum and volumetric or predetermined fill. Fillers for sanitary cans and wide-mouth glass are not included in this article. Fillers for these wide-mouth containers include gravity, plunger or piston fillers and other types of volumetric fillers which are usually classed as sanitary can fillers.

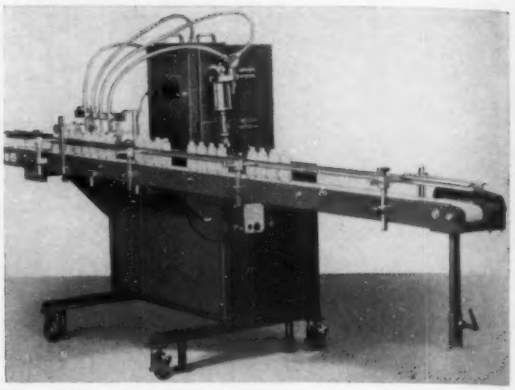
The *gravity-filling* principle is essentially the same in all types of rotary gravity fillers. It employs an overhead storage tank from which the product flows by gravity through a filling valve and cuts off uniformly to a predetermined level in the container. The top of the container is contacted by a seal and the air in the container passes through a vent tube allowing the product to flow into the container through a liquid port. The liquid rises to this predetermined level which is also the end of a sleeve tubing at which point the air vent is cut off. Since no more air can flow out of the container, air from the lower end of the sleeve to the container top or seal forms an air lock, stopping rise of the liquid.

Note that the vent tube must be clear before the filling cycle begins. With some products this is a self-cleaning operation while with others either vacuum or pressure is used to clean the vents.

The *gravity-vacuum* filling principle is best defined by stating that it is



UNIVERSAL straight-line vacuum filler handles many sizes of glass, metal and plastic containers. (*Biner-Ellison photo*)



PORTABLE automatic filler features indexing and bottle-positioning mechanism. Filling rate to 120 a minute. Interchangeable pump assemblies give full range of sizes. (*National Instrument photo*)

gravity-filling in a closed vacuum system. This means that the actual filling cycle or flow of liquid into the container is accomplished by gravity flow after vacuum has been established in the container equal to the amount of vacuum being carried in the storage tank above the filling valves.

The advantage of gravity-vacuum filling over straight gravity is the prevention of the filling of chipped neck bottles or bottles with holes or open cracks. The vacuum also prevents liquid leaks in the filling valve through defective or worn tip washers or packings until they are noted and replaced. The greatest advantage in gravity-vacuum filling, however, is the prevention of any loss of proof on alcoholic products. The gravity-vacuum principle is valuable in the filling of all products having a high evaporation point. This is kept to a minimum by such filling which also retains the advantages of no-drip and non-filling of cracked and broken containers.

Gravity and gravity-vacuum fillers generally are designed to fill a container to a predetermined level from the top of the container down. However, they can be designed at a slight additional cost to fill the containers at a level which is measured from the bottom of the container up to the predetermined level. This is of definite interest in certain applications as practically all glass containers are calibrated in content from the bottom of the container up to a predetermined level. Since the container is filled to a predetermined level the container accuracy itself is important and should always be kept in mind, particularly when deciding on a new container. Gravity and gravity-vacuum fillers will fill to an accuracy of plus or minus 0.005 in. in height in the neck of a 28 mm. container such as a whiskey bottle, and to plus or minus 1/64 in. in height in a container as large as a 404 can. Generally speaking, gravity-vacuum is recommended for 38 mm. and smaller containers.

Gravity or gravity-vacuum fillers will fill any free-flowing liquid such as vinegar, whiskey, wine, turpentine, juices, etc., as fast as or faster than other methods. Ketchup can be filled on gravity fillers faster and with less air incorporation than by any other method. Gravity or gravity-vacuum fillers are best suited for filling foamy products. Likewise, generally speaking, gravity or gravity-vacuum fillers will not fill heavy syrups, oils, salad dressing, etc., as fast as other methods in 28 mm. and smaller finishes.

Sprinkler-type containers, perfume and medical vials, etc., cannot be filled as efficiently on gravity or gravity-vacuum fillers as by other methods and some cannot be handled at all on gravity or gravity-vacuum fillers.

Gravity fillers can be designed very readily for bottom filling when it is necessary to employ this method for products that tend to foam. Gravity and gravity-vacuum fillers also are more generally adapted to filling light-wall containers such as F-style cans and the various new plastic containers.

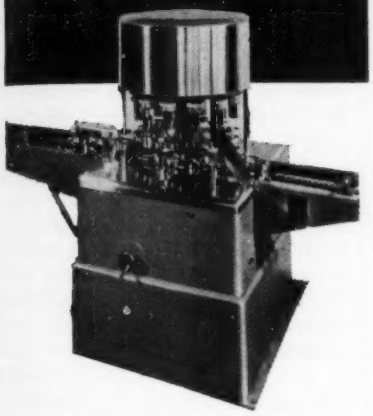
Gravity fillers can be adapted to meet all sanitary or dairy regulations which are being enforced more and more throughout the packaging industry, particularly with regard to food processing for human consumption. They are suitable for most special applications such as blanketing the product with nitrogen at time of fill. Gravity fillers are well suited to products which tend to separate or come out of emulsion in other filling methods.

Pressure-gravity fillers. Some emulsified products are of a very heavy viscosity not suitable for high production on the standard gravity or gravity-vacuum fillers. On these specific applications pressure-gravity filling is then incorporated. In other words, when the nature of a homogenized product indicates that gravity type of filling is the best method in order to eliminate separation but production cannot be secured with standard gravity or gravity-vacuum fillers, then the pressure-gravity method of filling can be employed. There are various ways to secure pressure-gravity filling but the most generally accepted method is the use of a booster pump capable of producing or maintaining 5 to 15 p.s.i. pressure over the liquid in the tank which materially increases the production obtainable over straight gravity filling. It is understood, of course, that a homogenized product with a tendency to foam calls for the right amount of pressure to secure maximum production and at the same time keep foam to a minimum. In other words, each product must be individually tested to determine just how much head pressure can be used.

Generally speaking, the more head pressure the faster the liquid comes in. However, in some cases, the faster the liquid comes in the more foam is created so a balance must be reached between rate of flow and foaming characteristics for the best possible production on the particular product being handled.

Vacuum and pressure vacuum. The vacuum-filling principle employs a tank or liquid reservoir which is located below the level of the base of the container being filled. Therefore, the liquid is drawn up (or forced up) into the container. The air is evacuated from the container through a vacuum connection which permits natural atmospheric pressure to force the fluid in (or draws the liquid up into)

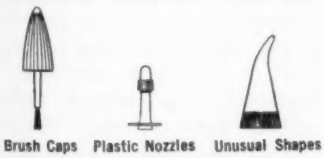
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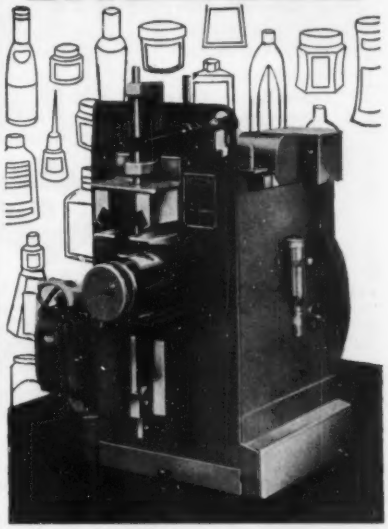
the container from the liquid reservoir. For each 2 in. of vacuum in the filling valve there is approximately 1 lb. of atmospheric pressure applied to the surface of the product in the supply tank. The containers are filled to a predetermined level the same as on gravity fillers. The overflow is carried through hoses to a common manifold from where it either drains back by gravity to the liquid reservoir or is pumped back to the liquid reservoir or main supply tank which is usually located above the filler. When the nature of the product requires it, it can be pumped back to the processing room ahead of the main supply tank.

Vacuum fillers will not fill a cracked or chipped glass container or a can with a bad seam. They can handle products with consistencies ranging from water to viscous glues. Generally speaking, vacuum fillers will fill products with the consistency of SAE-20 oil and all heavier materials faster than gravity fillers. Vacuum fillers can fill containers from 38 mm. all the way down to and including the sprinkler glass-finish containers. Most vacuum fillers can be designed for bottom filling when required to reduce foam. Some vacuum fillers have special defoaming systems available. Actually the overflow manifold or container is also a separator and prevents the product from entering the vacuum pump and often is used also to control or reduce foam. In order to minimize losses on volatile fluids, particularly alcohol products, various devices are now being developed which collect and condense the moisture in the air being drawn off by the vacuum pump. This condensed product or moisture is drawn off periodically and it is possible for it to be reprocessed or reclaimed.

Vacuum fillers are available all the way from two-valve hand units to multiple-valve rotary units capable of highest production speeds. They are also built in straight-line high-speed models as well as rotary. Computed on a basis that includes hand, straight-line and rotary fillers there are undoubtedly more vacuum fillers in actual use than any other type.

There are many different types of filling valves among the various vacuum-filler manufacturers even though the essential design principle is the same. One point to keep in mind is that filling valves which utilize a check ball or gasket seal, generally speaking, require more maintenance to prevent

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dripping than other types designed without check balls or gasket seals.

Pressure-vacuum fillers are a modification of the standard vacuum filler with a pressure feeder added to increase the rate of flow, particularly on heavy or viscous products. This type of vacuum filler is more expensive than the standard vacuum filler but the added cost is often more than justified by the increased production it makes possible.

Volumetric or predetermined fill for bottles. This type of filler utilizes a filler tank with very accurately controlled liquid level. Closely graduated measuring cups or cylinders immerse to full depth of product in one cycle and then lift and deposit this premeasured volume into the container in the second cycle. There are several designs for mechanisms or filling chambers which are essentially the same in principle—namely, that an accurately machined measuring chamber is filled and then deposits its complete contents in the container. This type of filler is best suited for handling expensive products or when the container inaccuracy is too great for gravity or vacuum filling. Until recently this type of filling has not been available in high-speed filling[2] and still is not available so it will compete with other types on a production basis.

A typical liquid filling line installation is composed of a feeding device, a container cleaner or washer, filler, capper and labeler. Case packers and completely automatic handling may be added. The feeding device and cleaner or washer are sometimes a single unit. The liquid filler usually is located between the cleaner or washer and the capper but there are some installations where it is advisable to label before filling. In such cases the filler is located between the labeler and capper. Where no cleaner or washer is in the line the filler would be the first unit after the feeding device or the second unit where the containers are pre-labeled.

Other types of liquid fillers are:

1. Counterpressure fillers—for carbonated liquids and beer.
2. Aerosol fillers—special fillers to suit type of aerosol and product.
3. Weight fillers—to weigh product filled into the container. Used for filling of expensive liquids and not available in high-speed equipment.
4. Syphon fillers—lowest priced fill-

2 See "Quick-Change Liquid Filler," MODERN PACKAGING, March, 1959, p. 102.

ers used only for comparatively low-speed filling. They eliminate the tendency to foam.

5. Bottom fillers—used mainly to eliminate foam or minimize oxygen pickup—can be gravity or vacuum.

6. Nitrogen blanket fillers—gravity fillers utilizing a blanket of nitrogen gas to eliminate oxygen pickup.

7. Meter or time flow fillers—measure by flow meters or time fill in relation to flow speed.

(See also article discussing viscous fillers, p. 428.)

Major factors determining the most efficient use of liquid fillers are:

Cleaning and lubricating. This is probably the most important factor in machine life and efficiency. Definite cleaning and lubrication schedules should be set up and rigidly followed according to machine requirements.

Filler capacity. Never operate a filler beyond the maximum recommended speed of the manufacturer. If higher speeds are required, check the manufacturer for possible alterations to the filler to enable it to handle the proposed increase without damage to equipment.

Controls. A modern filling line should be wired up electrically so that a control at any machine will close off that unit and all units preceding it. In case of emergency this stops the machine at the point of difficulty and stops all incoming containers, but containers beyond the point of difficulty can proceed. There also should be a master switch at each end of the line which can be used to stop the complete line.

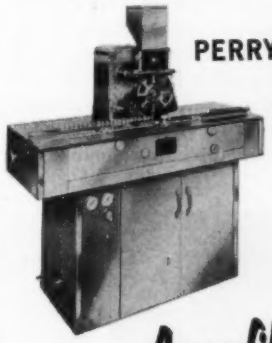
Container handling. Normally, all new equipment in a filling line is equipped with necessary feed screws, turrets, etc., to minimize glass fracture. However, if the customer wants to install something of this nature he should keep in mind that, in order to keep glass fracture to a minimum, glass contact should not be harsh. This is particularly true in feeding devices of the first machine in the line; these are sometimes custom built by the customer. At least 75% of all glass fracture occurs at this point. When possible, any filler line should have a straight-through conveyor. When this is impossible, overlapping disks or crossover transfers should be utilized. Avoid use of deadplate transfers.

Seals and packings. For accurate filling, all packings and gaskets should be in good condition. Inaccurate fills can result from worn parts.



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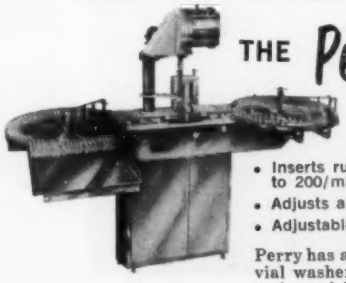
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FILLING VISCOUS PRODUCTS

by Marion O. Smith*

Two basic types of piston fillers—the straight-line and the rotary—are used for the filling of heavy consistency or viscous products. The range of viscosities handled by these fillers extends all the way from thin liquids to paste-like products such as cold cream or peanut butter. The piston filler excels in the handling of viscous products because it assures positive displacement of the fill load. A straight-line filler operates intermittently. The rotary provides continuous filling.

The *straight-line filler* finds its greatest use for products packed in glass containers and usually those with narrow neck openings, such as bottles for ketchup and chili sauce. Straight-line fillers are available with bottom-filling components which prove useful in the prevention of air inclusion and subsequent deterioration when packaging mayonnaise, salad dressing, ketchup and other viscous products. The speed or capacity of straight-line fillers is dependent on the number of filling nozzles that are incorporated in the design. The start and stop motion generally is controlled through a Geneva mechanism. These fillers are built for gravity or gravity-vacuum filling.

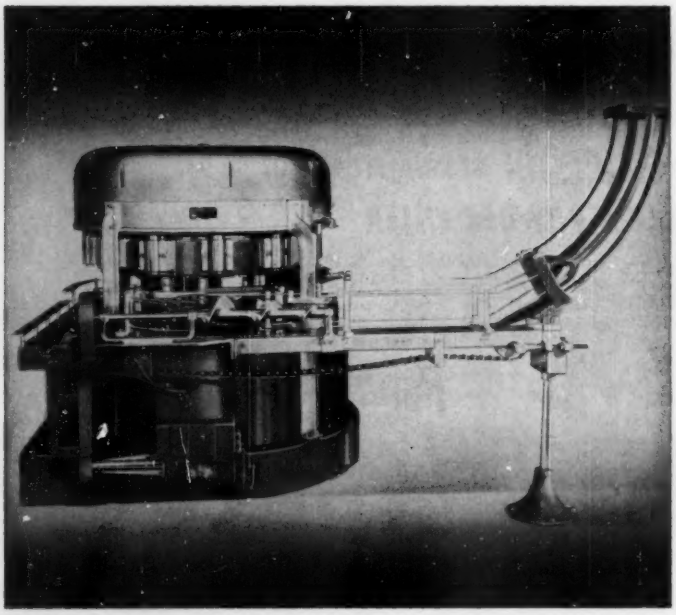
The *rotary plunger filler* is now classed as a universal-type filling machine since it is readily adapted to a wide range of products and containers. The product to be filled is gravity fed into the measuring cylinders from a supply tank directly above. Upward-moving pistons fitted into the cylinders then force the material out through the filling nozzles directly above the container stations. These stations are arranged in a circle out beyond the measuring pockets. Plungers operating in the nozzles assure discharge of all the product into the container. At any given time, containers are in various stages of fill since the operation is continuous with empty cans moving into the filler and the filled cans moving out. The filled cans are then discharged onto a revolving disk from which they are carried on belts to the sealing machine.

The speed and efficiency of the viscous-filling machines currently on the market have excelled anything believed possible 10 or 15 years ago. As new products have presented new challenges, machine refinements and attachments have been developed to carry this branch of the canning and bottling industry a long way from the first piston- or plunger-type filler.

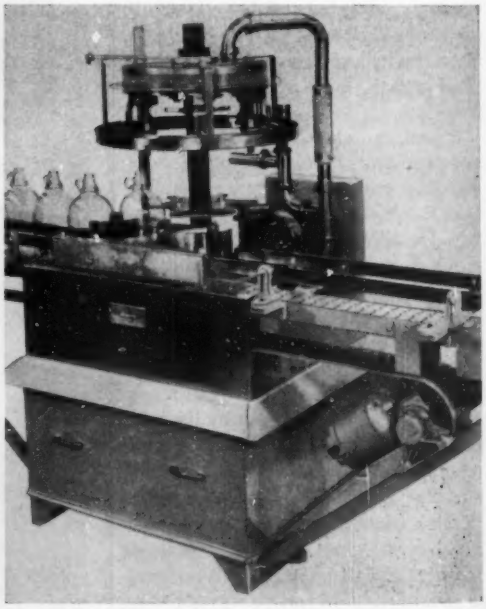
Among the modifications is the bottom-fill arrangement whereby nonleveling products, such as mayonnaise and peanut butter which have a tendency to leave air pockets, can be filled satisfactorily. Air pockets are now avoided by raising the container up over the filling spout so that filling is started at the bottom—as the filling progresses, the container is lowered. This method also can be employed to prevent foaming in products with that tendency.

A different type of nonleveling product, however, requires a different

*Plant Superintendent, Canning Machinery Div., FMC Corp., Hoopeston, Ill.

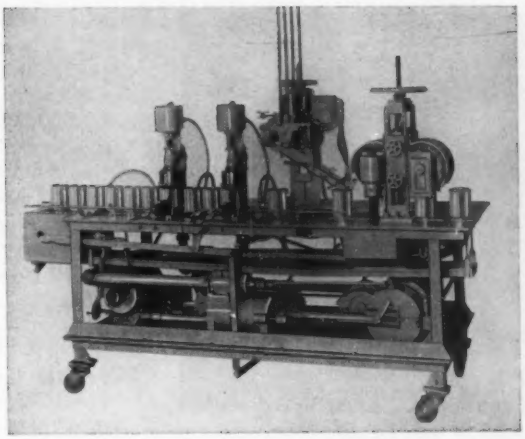


HIGH-SPEED plunger-type filler for large (from 1 to 5 qts.) cans and jars is especially recommended for No. 10 cans. It fills tomato paste, oil, applesauce, chocolate syrups, etc., at rate of 80-plus cpm (120 cpm for No. 10 cans). (*FMC Corp. photo*)

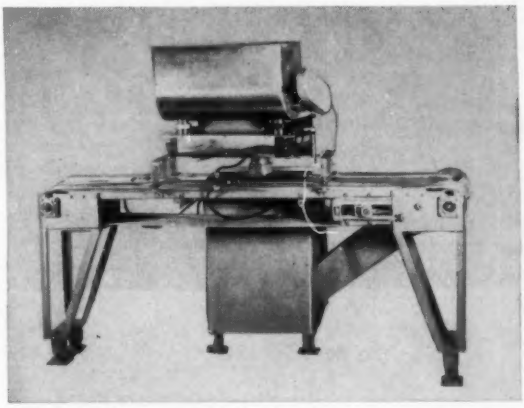


CONTINUOUS FILLING of viscous and semisolid products done by this unit in wide range of sizes and speeds. Handles products such as mayonnaise, honey, peanut butter, wax, etc. (*Biner-Ellison photo*)

remedy. Stew and products of similar consistency tend to form a mound and may overflow at the sealing station, causing uneconomical loss of product. This also can result in a poor seal which may lead to spoilage if product particles get into the end seam. To prevent this, toppers for pressing such products down into the container are now available.



PAINT FILLER has two filling heads to overcome paint surge; fills 25 to 30 gallons or 30 to 65 pints a minute. (*Elgin Mfg. Co. photo*)



TWIN-STATION, straight-line piston filler, designed for small canners, handles cans, jars and cartons from 4- to 128-oz. sizes at speeds ranging from 25 to 50 cpm. (*Pfaudler Co. photo*)

Special consideration

The lubricating characteristics of products have called for machine modifications, too. Different contact materials, such as stainless steel or bronze, are used in machines for filling products that have a corrosive effect on certain metals.

For example, motor oil quite naturally is easy to handle in modern viscous-product fillers. At the other end of the range, probably the most difficult products to handle are valve-grinding compounds and similar items where the abrasive is suspended in a greaselike substance. Excessive wear and tear on machine parts is certain to result because of cutting action by the product. Between these two extremes are products that cause varying degrees of wear and have a direct bearing on maintenance cost and life of the filler. Citrus concentrate, for example, makes the use of stainless steel and copper-bearing alloy contact parts in the filler a necessity to avoid excessive wear. The use of copper in one of two parts that rub together acts as a bearing material. In combination with a steel part, for example, copper tends to prevent galling of the two metals and contributes to longer wear.

Particle size of the product should determine the size of the ports in the filling machine. If the ports are too small, particles may be crushed and final product appearance will suffer. Therefore, to prevent damage, the ports in the filler should be much larger than the particles of the product. In the case of yielding products such as meats, the size of the ports on the filler can more nearly approach the size of the particles than would be the case with a product such as soup containing diced vegetables.

An important modification, developed many years ago and applicable to all filling machines regardless of specific filling problems, is the no-can, no-fill arrangement which prevents the delivery of the product unless the container is in place to receive it. The container controls the filling action and, when it is not in position, the product by-passes the nozzle and is forced back into the hopper. This of course can prevent considerable product loss and save clean-up time whenever a container misses its cue.

Standard fillers have been further adapted to the needs of particular products by the addition of attachments such as: a pocket loader for positive filling of the measuring pistons; stirrers for maintaining a consistent mix when product sizes vary, such as in vegetable soups; and hardened shearing parts for machines used in filling products such as fish which may contain small pieces of bone.

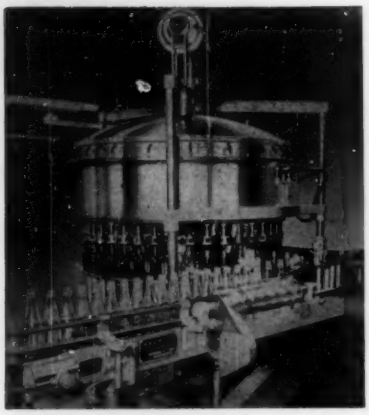
Cylinder sizes (length and diameter) of fillers are varied to meet certain ranges of container sizes. Generally speaking, a smaller diameter cylinder with a longer stroke piston will do a more accurate job of measuring than a larger diameter, shorter stroke machine. The piston- or plunger-type filler, when properly designed and constructed, provides accuracy of fill by volume with a minimum of maintenance.

Accessories and versatility

The rotary piston- or plunger-type filler employs one main design. Added accessories such as stirrers, scrapers, piston rings, screw plates, cut-offs, etc., and the use of different material contact parts allow the filling of most products of the viscous type.

A certain temperature range is usually required in the filling of food products so that the proper vacuum can be obtained. Food processors, therefore, aim to maintain a constant filling temperature, and corrections for temperature need not be a requisite of a filling machine. However, with other viscous products, such as oil in which temperature rises create different volumes, a method must be devised to compensate for such volume changes. Temperature-control devices that have proved successful are available for piston fillers.

No rotary piston- or plunger-type filler has yet been devised that will



GRAVITY FILLER for ketchup and chili sauce gives high-speed operation with exact fill, no aeration, and perfect container control. (*Horix Mfg. Co. photo*)

handle all sizes and types of containers successfully without requiring change of parts.

Factors which must be considered in the design of a filler are: the type of container (glass requires gentler handling), container size and specifications, and fill-range volume. Change parts, of course, can be obtained to allow handling containers of different sizes.

Speed versus accuracy

Speed of filling depends on a number of design factors. High-speed rotary fillers usually consist of a large number of pockets spaced equally on a large filling circle. Thus, the limiting factor for accurate fill, if all machining were perfect, would be the time required to fill one individual

Accuracy at the filler must also be container.

matched by good connection with the closer. If poor transfer from filler to closer results in slopping or spilling, the accuracy obtained at the filler is nullified. Moreover, the speed of the filler also can be limited by the rest of the line.

In fact, many instances occur each year where new filling equipment is installed and then it is found that some other operation in the line is the limiting factor. Another expenditure is required before balance can be achieved in the capacity of the line. In fact this leapfrogging can be inefficient and expensive.

In addition to the types of fillers just described, there are two other types in use for filling heavy viscous products, namely: (a) gravity fillers and (b) vacuum fillers.

Gravity fillers can be used when more than one product is to be filled into the same container and one of them is very liquid and the other of a more solid nature. Gravity fillers utilize spring-type valves which are opened by the pressure created by the container as it is raised by the cam action of the container lift. Since the seal or closing of the valve is surface-to-surface contact, products to be filled must be fine as well as quite liquid.

Vacuum fillers may be of the piston type in which a vacuum is created during filling so that no air will be included. Products such as ketchup, mayonnaise and similar products which deteriorate when air is included in packing are filled this way.

It might be well to point out here the great importance of accurate measurement in filling containers. Take, for example, an operation at a speed of 500 cans per minute. A ¾-oz. excess of product per can in an eight-hour run would amount to 30,000 oz. or 1,875 lbs. Needless to say, accuracy of measurement has been developed to a very high degree in piston- or plunger-type fillers.

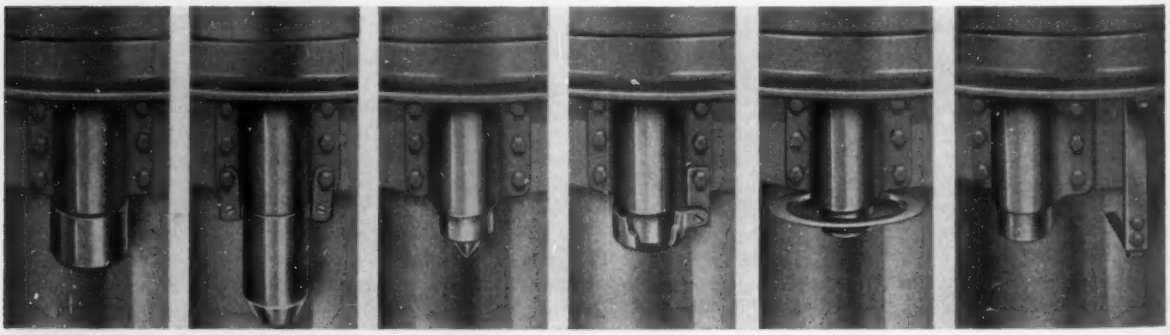
Outlook for the future

Small cans are now handled very satisfactorily at speeds in excess of 800 cans per minute and quart oil is being filled at speeds up to 500 cans per minute.

Right now, for example, manufacturers are developing methods of speeding up filling operations by proper banking of the curved can track of the filler in order to overcome or counteract centrifugal force, thus enabling the product to remain in the container even at high filling speeds.

The future is likely to see the development of filling machines that can fill 1,000 or more containers per minute with precision and accuracy and without the waste of product which tends to occur when machines are pushed beyond their rated speeds. At present, it is impossible to forecast accurately how long it will take to develop these higher-speed fillers. However, manufacturers are conducting research and development programs designed to give the canner a faster, more uniform fill.

Constant and continuous effort is being put forth to improve the materials in filling machines, to decrease maintenance costs and to improve sanitation features, all with the idea of enabling the packer to put up his product at an increasingly lower unit cost.



TAILORED-TO-NEED NOZZLES shown from left to right, include: (1) *stationary topper* to pack products such as corned beef hash; (2) *nozzle extension* to fill short cans; (3) *cone point nozzle plunger* to permit a product such as deviled meat to clear itself of the plunger; (4) *nozzle screen and holder* to remove lint and fibre, diffuse steam and retain drip while filling cans of lubricating oil; (5) *nozzle drip cup* to keep condensation out of cans of semifrozen concentrates during the filling process; and (6) *stationary knife* which serves the purpose of cutting stringy products such as dog food and thus assures efficient filling. (*FMC Corp. photo*)

Guide to Basic Types of Filling Machines

The information contained in this guide was obtained from questionnaires submitted to machinery makers as listed in the Buyers' Directory at the back of this book. This listing is only a representative outline of a much larger and more extensive group of machines actually available. An effort has been made to categorize the machines according to the physical nature of the products handled. In numerous instances, however, machines that fill powders, granules or flakes will also handle lumpy or sticky materials. Many liquid fillers handle viscous products and vice versa. Copyright 1961, Packaging Catalog Corp. All rights reserved, including the right to reproduce this chart or portion thereof in any form. Extra copies available. Quotations on request.

FILLERS FOR DRY PRODUCTS
Powders, granules, flakes 431
Lumpy or sticky materials 434
Brittle or fragile solids 435
Hard solids 435
Tablets, pills, capsules 437
FILLERS FOR LIQUIDS 438
FILLERS FOR VISCOUS PRODUCTS 441

FILLERS FOR DRY PRODUCTS

MACHINE NAME AND/OR MODEL NO.	GROSS WEIGH NET WEIGH VOLUMETRIC COUNT	SPEED RANGE UNITS /MIN.	CONTAINERS FILLED A-Aerosols B-Bags C-Cartons G-Glass M-Metal (cans, etc.) P-Plastic T-Tubes	FILL RANGE CAPACITY	BASIC FUNCTION, MAJOR USE OR MOST IMPORTANT FEATURE
POWDERS, GRANULES, FLAKES					
Aidlin Automation, Inc.					
Model A	Net	20-25	A, B, C, G, M, P	Any 1-4 ratio	Agitating hopper—prevents bridging, clogging
Aresco Machine Co., Inc.					
Loose Filler LF	Vol.	16-48	B, C, G, M, P, T	¼ oz.-3 lb.	Powders, granules, pastes; great accuracy
Utility Packer	Vol.	15-35	Bag	to 3 lb.	Produces triple fold closure with tape
PKK	Vol.	200-300	Forms, fills pouches	10mg.-3 oz.	Package sizes to 5⅞ x 12⅝
KIPAK	Vol.	30-60	Forms, fills pouches	to 3 lb.	Adjustable for different package sizes
KIWRAP	Vol.	to 250	Forms, fills pouches	Varies	Also powders, liquids, etc. in pillow pack
Aurelio Tanzi Eng. Co.					
"Acma 720"	Net, Vol.	60-65	Form, fill paper wraps	1 oz. max.	Prescription wrapper, small accurate doses
Automatic Scale Co.					
Model N	Net	10-40	B, C, G, M, P	1-1½ lb.	Coffee (gr. & bean). Similar products
B-O-F-I	Net	10-40	Bags	1 lb.	Coffee (gr. & bean). Similar products
Bartelt Engineering Co.					
Automatic Filler	Auger-spinner	10-200	A, B, C, G, M, P	1 gm. to 5 lb.	Free-flowing and granular foods, chemicals
Battle Creek Pkg. Mach.					
Filler "C"	Vol.	35-120	C, M	0-350 cu. in.	Free-flowing powders, dried beans, cereals
Bemis Bro. Bag Co.					
Feeding & Filling Mach.	Net	24-50	Bags	2-10 lb.	Free-flowing products: flour, cornmeal
Packer-Aid	Auger, G	6-12	Bags	50-200 lb.	Primarily flour
Gravity Packer	Net	6-12	Bags	25-100 lb.	Free-flowing products requiring settling
Rapid-Weigh Bagger	Net	10-24	Bags	25-200 lb.	Pelleted, granular, meal type fertilizers
Fastr-Weigh Bagger	Net	10-22	Bags	25-200 lb.	Pelleted, granular, cubed feeds
Bemis-Way Scales	Net	10-18	Bags	25-200 lb.	Granular or semi-free-flowing products
Packer-Ette	Gross	1-8	Bags	25-150 lb.	Products that establish angle of repose
Black Products Co.					
Type AF Airflow Packer	Gross	3-5	B (Valve type)	25-100 lb.	Powders and granulars with fines
Auger Type Packer	Gross	2-4	B (Valve type)	25-100 lb.	Granular, pellets or powder
Type PF Pressureflow	Gross	3-5	B (Valve type)	25-100 lb.	Granulars void of fines. Pellets
Brown Filling Machine Co.					
BFM Volumetric Filler	Vol.	20-300	Pouches	10 mg.-1 lb.	Free flowing dry products. High speed
BFM Sliding Measure Filler	Vol.	20-300	Pouches	10 mg.-1 lb.	Wide range of dry products
Builders Sheet Metal Wks.					
Pressure Filler #1	Vol.	1	Aerosols	30-100 ML	Laboratory pressure filling of propellants
Cold Filler #RB-2	Vol.	3	Aerosols	¼ oz.	Laboratory cold filling of propellants
Cloud Machine Corp.					
Stretchwrap "B" and "F"	Vol.	100-1500	P	1 gm.-1 lb.	Blister pack for salt, etc.

Fillers for Dry Products

MACHINE NAME AND/OR MODEL NO.	GROSS WEIGH NET WEIGH VOLUMETRIC COUNT	SPEED RANGE UNITS /MIN.	CONTAINERS FILLED A-Aerosols B-Bags C-Cartons G-Glass M-Metal (cans, etc.) P-Plastic T-Tubes	FILL RANGE CAPACITY	BASIC FUNCTION, MAJOR USE OR MOST IMPORTANT FEATURE
POWDERS, GRANULES, FLAKES (Cont'd)					
Clybourn Machine Corp.					
CMC	Vol.	20-200	Cartons	2 oz.-15 lb.	Soap powder, macaroni, grass seed, beans, candy, etc.
E. D. Coddington Mfg. Co.					
Model C Auger-Matic	Gross	2-8	Bags and cans	25-100 lb.	Fill and weigh valve type multiwall paper bags with powders, granules, pellets
Model AP Air-Pac	Gross	2-8	Bags and cans	25-100 lb.	
Consolidated Pkg. Machinery					
Unit Scales	Net	10-13	B, C, G, M	½-10 lb.	Especially sugar, coffee, rice, salt
Model "J"	Net	7-9	Bags	25-50 lb.	Feeds, chemicals, rice, sugar, salt
Model "A-100-B"	Net	10-15	Bags	35-150 lb.	Feeds, chemicals, rice, sugar, salt
Exact Weight Scale Co.					
103FM-0-10	Gross	3-15	B, C, G, M, P	⅛ oz.-3 lb.	
1001FM-11-30	Gross	1-10	B, C, G, M, P	3-50 lb.	Fill food, chemicals, seeds, confections, drugs. Fully enclosed types for sanitation. Explosion-resistant designs where required
4601NW-FM-0-10	Net	1-20	B, C, G, M, P	1-500 gm.	
610 NW-FM-11-30	Net	1-20	B, C, G, M, P	1 oz.-10 lb.	
4003 NW-FM-21-30	Net	1-15	B, C, G, M, P	50-300 lb.	
J.L. Ferguson Co. (now Packomatic Div., Textile Mach. Works)					
Telescoping Vol. Filler	Vol.	60-250	B, C, G, M, P	½-3 lb.	Granular products: salt, soap, meals, cereals or flour
4 and 8 Pocket Fillers	Vol.	60-80	B, C, G, M, P	½-10 lb.	
FMC Corporation Packing Equipment Div.					
Fluopacker	Net	3-30	Bags	25-100	Fluidizes powdered and granular materials: starch, talc, cement, gypsum, silica, etc.
FMC Corporation Canning Machinery Div.					
FMC 8 STA. Pea & Bean	Vol.	180 cpm	Cans & glass	6 oz.-#10	Gravity feed. Pre-measuring, filling, brining
FMC 15 STA. Pea & Bean	Vol.	350 cpm	Cans & glass	8-46 oz.	
FMC Flexi-Filler ST 12	Vol.	30-50	Cans	No. 2-No. 10	
FMC Flexi-Filler ST 18	Vol.	150-250	Cans	6 oz. No. 3	
FMC Flexi-Filler ST 24	Vol.	150-300	Cans	6 oz. No. 3	Gravity feed. Granular products. Pre-measuring
FMC St Line Filler 8S	Vol.	110 cpm	Cartons (top opening)	18.9 37.3 cu.in.	
FMC St Line Filler 16S	Vol.	240 cpm	Cartons (top opening)	72.7 135.1 cu.in.	
FMC Multi Utility Filler	Vol.	30-75	Cans		Cubed fruit and vegetables. Pre-measuring
FMC Multi Utility Filler	Vol	100-250	Cans	8 oz. 2½	
FMC Press Pack Filler	Vol.	25-35	Cans	#10	Whole or cut green or wax beans. Measuring
FMC 460 Hand Pack Filler	Vol.	30-60	Cans, glass jars	8 oz. #10	Any product not requiring positioning
FMCV-12 Carton Filler	Vol.	250 cpm	Cartons (end opening)		Frozen foods. Pre-measuring
FMC Corporation Simplex Plant					
Simplex-O-Matic Model "B"	Net or Vol.	25-40	Forms, fills cello. bags	½-5 lb.	Rice, beans, etc.
FMC Corporation Stokes & Smith Plant					
Stokeswrap	Net or Vol.	40-240	Forms, fills pouches	1 gm.-5 lb.	Four-seal, pillow pouch and tea bag
Little Wonder	Net	15-35	B, C, G, M, P	4 oz.-3 lb.	Gravity fill. No motor. Quick change-over
EG Filler	Gr., Vol., Vac.	5-40	B, C, G, M, P, T	1/16 oz.-10 lb.	Quick change-over, auger fill. Versatile
HG Filler	Gr., Vol., Vac.	50-140	C, G, M, P	¼ oz.-3 lb.	Auger fill, versatile
G-9 Packer	Vol.	5-30	B, C, G, M, P	1/16 oz.-10 lb.	Heavy duty design auger filler and packer
DHG-88	Vol., Gross	5-20	B, C, G, M, P	1-12 lb.	Bulk and dribble auger fill. Duplex packer and weigher. Automatic transfer
Neverstop	Vol.	50-450	Cartons	1 oz.-10 lb.	Opens, fills, seals detergents, cereals, etc.
Frazier & Son					
Whiz-Packer High-Speed	Vol.	60-400	G, C, T, M	¼ oz.-1 lb.	Accurate, dust-free filling
Whiz-Packer Bench and Floor Models	Vol.	10-60	B, C, G, T, M	⅛ oz.-5 lb.	Accurate, quick change-over
General Packaging Equip.					
Model A	Auger	40-60	Bags	1 gm. to 5 lb.	Malted milk, cake mixes
Geveke & Co., Inc.					
IWK P2 Portion Pkg. Mach.	Vol.	25-200	Forms, fills pouches	to ¼ lb.	Pillow packs, individual portions salt, sugar, etc.
Glendale Package Mach. Corp.					
GPMC Series No. 1200	Vol.	600	Forms, fills pouches	¼-5 gm.	Flavor concentrates, chemicals, etc.
GPMC Series No. 800	Vol.	300	Forms, fills pouches	3-10 gm.	Tea, spices, sugar, chemicals, etc.
GPMC Series No. 400	Vol.	150	Forms, fills pouches	1-5 oz.	Food mixes. Instant foods
Glengarry Processes, Inc.					
Mini-Weigh	Net	8	B, C, G, M, P	3-120 gm.	
Model B (Vibratory Feed)	Net	10	B, C, G, M, P	4 oz.-10 lb.	Dry powders. Multi-head units available
Heavi-Weigh (Vibratory)	Net	6	B, C, G, M, P	10-100 lb.	
B. F. Gump Co.					
Edtbauer-Duplex Net Wgr Models 1, 2, 3, 4, 4E	Net	6-28	B, C, G, M, P	4 oz.-75 lb.	With gravity feed or some power feeds; free- and nonfree-flowing products
Bar-Nun Models 20, 25, 35	Net	25-45	B, C, G, M, P	¼ oz.-5 lb.	Weigh, check-weigh one operation. Accurate
Bar-Nun Bag Feeders, Openers	Net	25-30	Feed, open bags	¼ oz.-5 lb.	Weigh-fill and eject paper bags
Gumpco Series 400, 600	Net	25-30	B, C, G, M, P	4 oz.-5 lb.	Power feeds; integrates in auto. lines
Bar-Nun "Auto Check" weighing and packing lines	Net	20-140	C, M	8 oz.-3 lb.	Multi-weigher lines; feed, weigh-fill and pack. High accuracy; dense packing action

Fillers for Dry Products

MACHINE NAME AND/OR MODEL NO.	GROSS WEIGH NET WEIGH VOLUMETRIC COUNT	SPEED RANGE UNITS /MIN.	CONTAINERS FILLED A-Aerosols B-Bags C-Cartons G-Glass M-Metal (cans, etc.) P-Plastic T-Tubes	FILL RANGE CAPACITY	BASIC FUNCTION, MAJOR USE OR MOST IMPORTANT FEATURE
POWDERS, GRANULES, FLAKES (Cont'd)					
Fr. Hesser, Maschinenfabrik AG					
Type AWV	Vol.-Auger	40-100	B, C, G, M, Cans	20 to 2,750 ccm	Auger accuracy. Flour, mixes, jelly crystals
Type GGK	Net	15-24	B, C, G, M, Cans	50 gm.-5 lb.	Precision double weighers: coffee, tea, etc.
Type ARH	Vol. plate	40-350	B, C, G, M	200-3,000 ccm	Plate-type filler for soap, powders, rice, peas
Hesser PDBR, PDHJ, PUB	Net. Vol.	60-200	Forms, fills bags (1-2 ply)	to 5 lb.	Coffee, tea, cocoa powder, peas, sugar, other free-flowing granular goods. Speeds: PDHJ—70-100; PDBR—60-75; PUB—100-200
Hesser PU	Vol.	150-350	Opens, fills bags	200-6,000 ccm	Free-flowing powdery goods; sugar, salt, etc.
PKBR	Vol., Auger	40-70	Forms, fills bags, 1-ply	¼-5 lb.	Flour
PDBR 3f	Net	60	Forms, fills bags	1 lb.	Pliofilm or K-cellophane-lined coffee bags
PDHJ 3 Vacu 16	Net, Vol.	60	Cartons with film combination liner	1 lb.	Forms, fills, evacuates, gases, seals. Ground coffee, milk powder
Karstrom Co.					
Spee-Dee Models BR 1-4, THR 1-4, BR 6, DR	Vol.	9-72 9-36	C, M, P, B, G, T	2 gm.-25 lb.	BR fills 2 gm. to 2 lb.; THR fills 2 gm. to 5 lb.; BR 6 fills 2 gm. to 15 lb.; DR fills 2 to 25 lb.
Spee-Dee-Matic	Vol.	9-200	C, M, P, G, T	2 gm.-25 lb.	Auto. no-container-no-fill; conveyer available
Ketchpel Engineering Co.					
Auger Feed Model 40-.012	Vol.	25-45	Bags	0.7-6 gm.	Powders in envelopes or into products
Fil-Pak Model 00	Vol.	to 60	B, C, G, M	6 gm.-8 oz.	Especially insecticide powders, etc.
Leedpak, Inc.					
Leedpak Filler	Various	160-400	Bags	1/10-4 oz.	Wide range pouch forming machines
Leedpak Fibre Can Line	Various	50-200	C, M, P, T	1 gm. up	Form, fill fibre and plastic cans
Lynch Corporation					
Lobo Feeder	Vol.	to 240	Bags	1 oz.-5 lb.	For Robo-Wrap bag form, fill, seal machines
G. Diehl Mateer Co.					
37-A Dual, 33-A Single Head Filler	Vol.	30-240	A, B, C, G, M, P	100 mg.-10 lb.	Foods, spices, drugs, chemicals. Interchangeable to liquids and high viscosity materials
31-A Bench Model Filler	Vol	10-70	A, B, C, G, M, P, T	100 mg.-10 lb.	
34-B Rotary Continuous Filler	Vol.	120-360	C, G, M, P	1-30 oz.	Foods, drugs. Accurate fill at high speeds
Mercury Heat Sealing Equip.					
Verti-Pak (Mer. Scales)	Net	10-45	Bags, pillow type	0-50 lb.	Variable density powders
Verti-Pak/with auger feed	Vol.	10-45	Bags, pillow type	0-25 lb.	Constant density powders
Strip-O-Matic/auger feed	Vol.	30-300	4-sided pouch	0-6 oz.	Constant density powders used with foils, films, laminations
Pouch master	Vol.	100-150	Pouch (3-sided seal)	0-16 oz.	Constant or variable density powders
Mettler Instrument Corp.					
DWA	Net	6-15	All containers	to 3 oz.	High accuracy with low capacity
John R. Nalbach Engr. Co.					
Model 16 RC	Vol.	to 90	C, G, M, P, T	Approx. ½-5 lb.	Free-flowing powders, granulated materials, chemicals, cleansers, detergents, foods
Model 24 RC	Vol.	to 200	C, G, M, P, T	Approx. ½-5 lb.	
Model 40 RC	Vol.	to 400	C, G, M, P, T	Approx. ½-5 lb.	
Model 1 AS-AF	Vol.	to 30	C, G, M, P, T	Approx. ½-10 lb.	Free-flowing granules, chemicals or foods
National Instrument Co.					
Filamatic Universal	Net	5-20	B, C, G, M, P, T	1 gm.-2½ lb.	Powders and granular materials
Package Machinery Co.					
Transwrap S-750	Net,Vol., Auger	to 150	Bags	Grams-5 lb.	Bag forming, filling, sealing
Pak-Rapid, Inc.					
Model FFL	Vol., Count	to 120	Form, fill pouches	1 lb.	Free-flowing powders, granules, nuts, candy
Plageman Enterprises, Inc.					
CP-55	Vol.	30-35	Form, fill bags	1/300-2 oz.	Free-flowing powders; flower seeds
ASP	Vol.	20-50	B, C, G, M, P	1/300-2 oz.	Seeds, pellets and granules
PBC	Vol.	5-15	B, C, G, M, P	4 oz.-1 lb.	Peas, beans, corn or pellets
Pneumatic Scale Corp.					
Bag Flour Packer—Small	Gross	25-30	Bags	2-7 lb.	Flour in cloth, paper bags
Bag Flour Packer—Med.	Gross	15-25	Bags	2-25 lb.	Flour in cloth, paper bags
Bag Flour Packer—Large	Gross	10-16	Bags	10-50 lb.	Flour in cloth, paper bags
Vacuflow Jr.	Vol.	20-30	C, G, M	1½ oz.-1 lb.	Short run dustless filling
Rotary Vacuflow	Vol.	40-300	C, G, M	1¼ oz.-5 lb.	Snuff, soluble coffee, talcum
Pneumatron	Net	60-120	Cartons	3 oz.-6 lb.	Stream weighing with cantilever assembly. Works on air pressure principle
Velocitron HS Pkgr	Vol., Net	to 300	Cartons	1-3 lb.	Complete packaging combination. Sev. models
2-Hd Weigher	Gross	30	Cartons	1-7 lb.	Wide range of products: spices, mixes, etc.
3-Hd Weigher	Gross	30-35	Cartons	1-7 lb.	For large size flour and detergent filling
Rex Packaging Mach. Co.					
32 VTT	Vol., Count	80-120	Cartons	3-8 oz.	Hard candy, screws, drug granules, powders
32 VGG	Vol.	40-80	Cartons	½-5 lb.	Seeds, gravel
22 VGG	Manual	80-120	Cartons		Parts, food items, bottles, bags
Richardson Scale Co.					
FP	Net	6-7	B, C	25-150 lb.	Grains
G-17	Gross	4-5	Bags	10-140 lb.	Granular and ground materials
GA-17	Gross	5-10	Bags	10-140 lb.	Granular and ground materials
E-50	Net	2-10	B, C	25-200 lb.	Cereals, feeds, chemicals

Fillers for Dry Products

MACHINE NAME AND/OR MODEL NO.	GROSS WEIGH NET WEIGH VOLUMETRIC COUNT	SPEED RANGE UNITS /MIN.	CONTAINERS FILLED A-Aerosols B-Bags C-Cartons G-Glass M-Metal (cans, etc.) P-Plastic T-Tubes	FILL RANGE CAPACITY	BASIC FUNCTION, MAJOR USE OR MOST IMPORTANT FEATURE
POWDERS, GRANULES, FLAKES (Cont'd)					
St. Regis Paper Co.					
Force Flow Packer	Gross	to 30	Bags	25-50-100 lb.	Free-flowing powders. Valve packer
Fluopacker	Gross	to 20	Bags	25-50-100 lb.	Free-flowing powders. Valve packer
Vredomatic (O.M.)	Net	to 12	Bags	25-50-100 lb.	Free-flowing powders. Open mouth
Screw Packers	Net, Gross	to 4	Bags	25-50-100 lb.	Free-flowing powders. Valve packer
Smico, Inc.					
Smico Tornado Mark I, II, III, IV, V	Net	35 to 60	Bags	2-25 lb.	Mark I, II and III—2 10-lb. bags. Mark IV and V—10 25-lb. bags. Flour, dog food, sugar, powdered milk
Stuyvesant Engineering Corp.					
Fillmaster Single Hopper	Vol.	to 60	B, C, G, M	1 oz.-10 lb.	Inexpensive unit. Short or long runs. Fast change-over. Powders, nuts, bread crumbs, cereals, seeds, popcorn, detergents, coffee, candies, rodenticides, beans, etc.
Fillmaster Single, Twin and Double	Vol.	to 240	C, G, M	1 oz.-10 lb.	
Swiss Industrial Co.					
SIG KF Types	Net, Vol., Gross, Auger	60-100	B, C	7-100 cu.in.	Double Package Makers for single, double-walled bags, lined cartons. Glue or heat seal
SIG O Types	Net, Vol., Auger	60-300	Cartons	11-153 cu.in.	Opens, fills, seals detergents, cereals, etc.
SIG PFC Types	Vol., Auger	to 150	Forms, fills pouches	approx. 4 oz. max.	Four-seal type pouches
SIG BCS Types	Vol., Auger, Net	to 55	Bags	18-110 cu.in.	Pre-fabricated bags from magazine. Opens, fills, closes automatically. Various closures
Thayer Scale Corp.					
G18R	Gross	2-5	B, C, M	25-200 lb.	Chemicals, powders, food products
N18R	Net	3-6	B, C, M	25-200 lb.	
2N18G	Net	18-24	B, C, M	25-250 lb.	Chemicals, fertilizers, food products
Tol-O-Matic, Inc.					
Universal Baler	Small filled bags	8-12	Bags	1-25 lb.	Assembles patterns and loads smaller-sized filled bags into master container called a Baler Bag
Bag Baler 50/100, 2/25	Filled bags	8-16	Bags	50-100 lb. 5-25 lb.	Two models: one loads 50 or 100-lb. bags into a paper slip or baler bag; other loads two 25-lb bags into master baler bag
Triangle Package Mach. Co.					
U-12 Auger Filler	Vol.	to 30	B, C, G, M	2 oz.-10 lb.	Semi- to free-flowing products as flour
L-2, L-22 Form, Fill and Seals	Net or Vol.	to 120	Bags	to 5 lb.	Free-flowing goods into heat-sealable film
CS-2 Carton Sealer	Net or Vol.	70	Folding cartons	to 10 lb.	Form, fill, settle material and glue seal
Elec-Tri-Pak Scales	Net	to 35	B, C, G, M	to 10 lb.	All free-flowing products including pieces
Elec-Tri-Pak Scales	Net	to 120	C, M	to 10 lb.	Auto. registration of containers, scales
Union Bag-Camp Paper Corp.					
UB-95, UBS-95	Gross	8-12	B, P	50-80-100 lb.	Limited production. 1-, 2-man operation. Free-flowing granules. UBS-95, greater accuracy
UB-100, UB-101	Net	20-25	B, P	25-100 lb.	High-speed. Paces operator. No clamps. UB-101, high weight accuracy, quick change
U.S. Auto. Box Mchy. Co.					
"Bond" Model MH	Gross, Vol.	to 40	B, C, G, M, P	¼ oz.-10 lb.	Powders: drugs, fertilizers, foods, etc.
"Bond" Model JN	Gross, Vol.	to 120	C, G, M	¼ oz.-5 lb.	
"Scott" Scales & Feeders	Net	to 40	B, C, G, M, P	1 oz.-10 lb.	Free-, semi-free-flowing: coffee, rice, tacks, etc.
Wilcox Manufacturing Co.					
Wilcox Pencil Bander	Count	30-60 doz.	Cartons	10-12 pieces	Insert pencils in paperboard band
The Woodman Co., Inc.					
Air-Weigh-Matic, Model A, Air-Weigh Model F	Gross	to 55	Pre-formed bags	⅛-8 oz.	Automatic weighing, filling for pre-formed bags. Potato chips, other snack items
Air-Weigh-Pac, Model CL, CH	Net	to 40	Forms, fills bags	2-16 oz.	Cookies, hard candies. Minimum breakage. For use with separate net weigher
Air-Weigh Dual-Pac Model AH	Net	to 80	Forms, fills bags	⅛-4 oz.	Automatic net weigher. Potato chips, etc.
Fleet-Weigh DL, DS, L & S	Net	to 50	B, C, cans, trays	2-16 oz.	Automatic weigher. Cookies, potato chips, etc.
Plur-A-Matic Models E & D	Net	to 60	B, C, cans, trays	2-16 oz.	Automatic weigher. Nuts, candies, etc.
Wrap-Ade Machine Co.					
Model UPA	Vol., Auger	40-60	Forms, fills bags	2-3 oz.	True powders: flour, bi-carb, talc
Model UPV	Vol.	50-400	Forms, fills bags	2-3 oz.	Salt, sugar, rolled yeast, etc.
Wright Machinery Co. Div. Sperry Rand					
Wright N.T. Weigher	Net	80-120	C, M	4-20 oz.	Cereals, cookies, etc. in rigid containers
LUMPY, STICKY MATERIALS					
Bartelt Engineering Co.					
Automatic Filler	Auger	10-120	A, B, C, G, M, P	1 gm.-5 lb.	Especially cake mixes and specialty foods
Bemis Bro. Bag Co.					
Packerette	Gross	1-8	Bags	25-150 lb.	Semi-sticky products such as molasses feeds

Fillers for Dry Products

MACHINE NAME AND/OR MODEL NO.	GROSS WEIGH NET WEIGH VOLUMETRIC COUNT	SPEED RANGE UNITS /MIN.	CONTAINERS FILLED A-Aerosols B-Bags C-Cartons G-Glass M-Metal (cans, etc.) P-Plastic T-Tubes	FILL RANGE CAPACITY	BASIC FUNCTION, MAJOR USE OR MOST IMPORTANT FEATURE
LUMPY, STICKY MATERIALS (Cont'd)					
Brown Filling Machine Co.					
BFM Auger Filler	Vol.	20-100	Pouches	10 mg.-2 oz.	Wide range of powders. Accuracy, speed
E. D. Coddington Mfg. Co.					
Model C Auger-Matic	Gross	2-8	Bags and cans	25-100 lb.	Semi-sticky products: molasses, shortenings
FMC Corporation					
Stokes & Smith Plant					
EG Filler	Gr., Vol., Vac.	5-40	B, C, G, M, P, T	1/16 oz.-10 lb.	Quick change-over, auger fill. Versatile
G-9 Packer	Vol.	5-30	B, C, G, M, P	1/16 oz.-10 lb.	Heavy-duty design auger filler and packer
DHG-88	Vol., Gross	5-20	B, C, G, M, P	1-12 lb.	Automatic transfer. Bulk and dribble auger fill. Duplex packer and weigher
Stokeswrap	Net, Vol.	40-240	Forms, fills pouches	1 gm-5 lb.	Four-seal or pillow type pouch packages
HG Filler	Gr., Vol., Vac.	50-140	C, G, M, P	¼ oz.-3 lb.	Auger fill. Versatile
Glengarry Processes, Inc.					
Model B (Belt Fed)	Net	8	B, C, G, M, P	4 oz.-10 lb.	Sticky materials. Multi-head unit
Heavi-Weigh (Belt Fed)	Net	6	B, C, G, M, P	10-100 lb.	
Ketchpel Engineering Co.					
Fil-Pak Model 22-19	Vol.	to 60	B, C, G, M	6 gm.-8 oz.	Nonflowable insecticide powders
Lynch Corp.					
Wey-Mor Model WM-7	Net	12-72	Pre-formed, formed bags	6 oz.-5 lb.	Raisins, figs, sticky confectionery products
Package Machinery Co.					
Transwrap S-750	Net	75	Form, fill bags	Grams to 5 lb.	Standard model. Wide range products
Pneumatic Scale Corp., Ltd.					
Cone Feed Wgr	Gross	30-35	Cartons	1-3 lb.	Mix or flour with shortening content
Rotary tube Wgr	Gross	25-30	Cartons	1-2 lb.	For brown sugar, pie crust flour, etc.
Rex Packaging Mach. Co.					
22 H TT	Manual	60-100	Cartons		Food items, spices, pies, sanitary products
Richardson Scale Co.					
G 38	Net	2-10	B, C	50-200 lb.	Molasses feeds
H 39	Net	1-8	B, C	100-300 lb.	Lumpy materials, fertilizers, etc.
Thayer Scale Corp.					
G 18 C	Gross	3-8	B, C, M	25-250 lb.	Chemicals, fertilizer, food products
2N 18 C	Net	20-24	B, C, M	25-250 lb.	
BRITTLE OR FRAGILE SOLIDS					
Bartelt Engineering Co.					
Automatic Filler	Spinner	10-120	B, C, G, M, P	1 gm.-5 lb.	Potato flakes, noodles
Eagle Machinery Co., Ltd.					
A-15	Net	15-30	B, C, M, P	½-5 lb.	Raisins, prunes, apricots, etc.
Fairchild's, Inc.					
Models #27, #33, #27-A, #33-A	Count	4-8,000	B, C, G, M, P	1 to 5000	Small items, tablets, capsules, etc.
General Packaging Equip.					
Model PC	Net, Vol.	30-60	Pillow bags	Ounces	Potato chips, noodles, etc.
Lynch Corp.					
Wey-Mor Model WM-3-CF	Net	12-60	Pre-formed bags	½ oz.-1 lb.	Potato chips
Mercury Heat Sealing Equip.					
Strip-O-Matic with turret	Count	30-300	4-sided pouch	0-2 lb.	Small electrical components
Verti-Pak, Inclined	Count	40-80	Bags (pillow type)	0-25 lb.	Large, flat fragile products; pretzels, etc.
Pak-Rapid, Inc.					
models HC, HT, CHMO, FH, AH, VH	Vol., Count	to 140	Pouches	to 2 lb.	Watch parts, diodes, cookies, toys. Vac. & gas packaging of meats, cheese
Pneumatic Scale Corp.					
Pneumatron Weigher	Net	30-120	Cartons	8 oz.-3 lb.	Crackers, pretzels, macaroni, etc.
Tele-Sonic Packaging Corp.					
Model 015 SH.P.	As required	15-35	Bags	Under 1-5 lb.	Guides product deep into bag
Wrap-Ade Machine Co.					
Model UPC	Count	20-150	Forms, fills bags		Toys, parts, pretzels, surgical blades, etc.
Wright Machinery Co.					
Div. Sperry Rand					
Advanced Bagmaster	Net	to 44	Forms, fills bags	1-6 oz.	Potato chips. Pillow-type bags
Hy-Tra-Lec Model "C"	Net	20-25	B, C, G, M	¼ oz.-1 lb.	Free-flowing products: potato chips, pretzels
HARD SOLIDS					
American Machinery Corp.					
PacRite	Count	1,600	Bags and boxes	2-999	Citrus fruit packer
Arenco Machine Co., Inc.					
IMK-A	Unit	to 66	Forms, fills pouches		Pouch former. Fill range depends on material
Bartelt Engineering Co.					
Magazine Fillers	Count	10-200	B (pouches), C	As required	Custom designed for Bartelt machinery

Fillers for Dry Products

MACHINE NAME AND/OR MODEL NO.	GROSS WEIGH NET WEIGH VOLUMETRIC COUNT	SPEED RANGE UNITS /MIN.	CONTAINERS FILLED A-Aerosols B-Bags C-Cartons G-Glass M-Metal (cans, etc.) P-Plastic T-Tubes	FILL RANGE CAPACITY	BASIC FUNCTION, MAJOR USE OR MOST IMPORTANT FEATURE
HARD SOLIDS (Cont'd)					
Batchelder Engineering					
Exact Count Screw Filler	Count	to 1,700	Cartons	1-100,000	Screws by exact count
Exact Count Nut Filler	Count	to 5,000	Cartons	1-100,000	Machine nuts by exact count
Brown Filling Machine Co.					
BFM-Rotary Drum Filler	Vol.	10-60	B & Pouches	10 mg.-2 oz.	Accuracy. Minimizes product damage
Clybourn Machine Corp.					
Tuc-Pac	Count	30-70	Cartons	1 or more pieces	Candy cigarettes, envelopes, tubes
Count-O-Matic					
Hoppermatic	Count	to 1,000	B, C, G	1-30 units	Orient, feed, count items: screws, nuts
Disc-O-Matic	Count	to 4,000	B, C, G	Unlimited	Cylinder-shaped washers, bushings, etc.
Delta Engineering Corp.					
Universal Model "F"	Count	500-4,000	B, C, G, P	1-10,000	Electronic counting; hardware items
Fairchild's, Inc.					
Models #27, #33, #27-A, #33-A	Count	4-8,000	B, C, G, M, P	1-5,000	Small items; tablets, capsules, etc.
FMC Corporation Stokes & Smith Plant					
Stokeswrap	Net, Vol., Count	40-240	Form, fill pouches	1 gm.-1 lb.	Four-seal or pillow-type pouch packages
General Packaging Equip.					
Model C	Count	30-150	Bags	Depends on product	Parts, toys, individually packed
Geveke & Co., Inc.					
IWK K80.1 Cartoner	Count	120-200	M, T		Inserts bottles, tubes, etc. into cartons and seals (Tuck-in or glued)
B. F. Gump Co.					
Gumpco Series, 400, 600	Net	25-30	B, C, G, M, P	4 oz.-5 lb.	Single or multiple units. Choice of feeds. Candies, nutmeats, hardware, etc.
Lynch Corp.					
Wey-Mor Model WM-8	Net	12-72	Bags	6 oz.-2 lb.	Wrapped marshmallows, nuts in shell, etc.
Mercury Heat Sealing Equip.					
Verti-Pak with scales	Count, Net	30-40	Bags (pillow type)	0-10 lb.	Hardware, nut meats, radishes, rubber-bands, frozen foods
Verti-Pak with conveyor	Count	40-50	Bags (pillow type)	0-25 lb.	Hardware, balloons, card assortments
Mettler Instrument Corp.					
SZ-2	Net	500-1,500	Small vials, bags	to 10,000 parts per package	Counting of subminiature parts up to 1/10 in. maximum dimension, i.e. watch jewels, sapphire needles, small axles, minute screws
The Olofsson Corporation					
(8) Scale Weigher	Net	70	B, C, G, M, P	0-3 lb.	Cereals, potato chips. Trims off excess weight
Package Machinery Company					
Transwrap S-750	Spec. convey.	75	Form, fill bags	5 lb.	Standard model. Wide range products
Pak-Rapid, Inc.					
Models: HC, HT, CHC-T, CH3C-T, CHM, FH, AH, VH	Vol., Count	to 140	Pouches	to 2 lb.	Nuts, bolts; aircraft parts, etc. Vac. & gas packaging of meats, cheese
Quickpak Mchy. Corp.					
Quickpak Automatic		10-35	Forms, fills pouches	2×2"-25×25"	
Model "U"		8-12	Forms, fills pouches	2×2"-20×20"	Side weld bag—loads and seals
Model R-16		6-8	Forms, fills pouches	2×2"-16×16"	
F. B. Redington Co.					
9E	Vol.	120-300	Cartons	1-2 oz.	Chocolate covered peanuts, etc.
9H	Count	150	Cartons	to 20 count	Cough drops
Rex Packaging Mach. Co.					
22 HGG	Manual	60-100	Cartons		Pies, food items. Bottles, tubes. Sanitary products, paper cups
Standard Packaging Corp.					
Flex Vac Model 6-12	Net	70	B, P	8 oz.	Vacuum package and controlled atmosphere
Flex Vac Model 6-9	Vol.	30	B, P	16 oz.	
Tele-Sonic Packaging Corp.					
Model 015-SH.P.	As required	15-35	Bags	Under 1-5 lb.	Guides product deep into bag
Union Bag-Camp Paper Corp.					
Magazine bagger V113		600	Bags	6 bags/min.	Opens, closes bag; inserts magazines
Sugar baler—Model 123		144	Bags	20 bags/min.	Accumulates, collates 5-lb. bags in baler. No compression section for bag closure
Dry ice bagger		6	Bags	6 bags/min.	Packs dry ice into paper bag. Closure tape
U.S. Automatic Box Machy. Co.					
C-10 Cartoner	Vol., Count	60	Cartons	1 to 2 oz.	Cough drops, hard candy, etc.
CA Cartoner		60	Cartons	Depends on product	Inserts tubes, bottles, etc.
Wrap-Ade Machine Co., Inc.					
Model UPC	Count	20-150	Forms, fills bags		Toys, parts, pretzels, surgical blades, etc.

Fillers for Dry Products

MACHINE NAME AND/OR MODEL NO.	GROSS WEIGH NET WEIGH VOLUMETRIC COUNT	SPEED RANGE UNITS /MIN.	CONTAINERS FILLED A-Aerosols B-Bags C-Cartons G-Glass M-Metal (cans, etc.) P-Plastic T-Tubes	FILL RANGE CAPACITY	BASIC FUNCTION, MAJOR USE OR MOST IMPORTANT FEATURE
HARD SOLIDS (Cont'd)					
Wright Machinery Co. Div. Sperry Rand					
Hy-Tra-Lec "M"	Net	24-48	B, C, G, M	½ oz. - 16 oz.	Candy, cookies, crackers, brickettes
Wright Junior Weigher	Net	to 20	B, C, G, M	½ oz. - 16 oz.	Hard candy, beans, seeds, nuts
2—S.G. Weigher	Gross	24-30	Cartons	4 - 16 oz.	Forms, fills and weighs cartons with free-flowing product, especially candy
Wrightronic Weigher	Customed	40-200	A, C, G, M, P	3 lb. max.	Weigh head, custom feeds, check-weigh
TABLETS, PILLS, CAPSULES					
Arenco Machine Co., Inc. TMK	Unit	300	Forms, fills pouches		Tablet sizes to 1½ in. dia. To 4 pills in a row
Bartelt Engineering Co. Special Pill Feeders	Vol., Count	As nec.	Pouches and cartons	As required	Custom designed for Bartelt machinery
Brown Filling Machine Co. BFM-Vibracount	Count	1200 pc.	B, C, G, M, P	0-36	Accurate counting coated or uncoated
Arthur Colton Co.					
#715	Batch count	7,500	G, M	0 - 500	Low cost, tablet and capsule counters. Quick visual inspection of tablets. Perfect count. Coated or uncoated tablets
#705	Batch count	4,500	G, M	0 - 150	
#710	Batch count	4,500	G, M	0 - 75	
#701	Batch count	600	G, M, T	0 - 600	Flat tablet—stacks, inserts in vials
Count-O-Matic Inc. Count-O-Matic Model A	Count	5,000	C, G, M	Unlimited	Counting is done electronically
Cozzoli Machine Co. T400 Series	Count	5-100	B, C, G, M, P, T		Small components. Tablets and capsules
Delta Engineering Corp. Universal Counting Mach.	Count	20,000	Bottles	6-1000 per bottle	Electronic counting—tablets or capsules
Exact Weight Scale Co. 110NW-FM-O-10	Net	10-15	A, B, C, G, M, P	1 oz. - 3 lb.	
Fairchild's Inc. Models #27, #33, #27-A, #33-A	Count	4-8,000	B, C, G, M, P	1 to 5,000	Small items, tablets, capsules, etc.
FMC Corporation Stokes & Smith Plant					
Stokeswrap	Net,Vol.,Count	40-240	Forms, fills pouches	1 gm.-1½ lb.	Four-seal or pillow-type pouch
Geveke & Co., Inc.					
MFM (IWK)	Count	to 2,400	G, M		Pills, lozenges, capsules
IWK EZ 31	Count	to 110	Foil, paper, etc.		Rectangular tablets
The Lakso Company, Inc.					
Model 34 Sampler	Count	10-60	C, G, M, P, B, T	1 - million	Small flexible machine. Moderate production
Model 40, Model 48	Count	45-150	C, M, P, B, G, T	1 - million	Med. production. Model 48—uncoated tablets, capsules. Model 40—coated tablets only
Model 58 Electronic	Count	15-90	C, M, P, B, G, T	1 - million	Semi-automatic. Very flexible, no change parts. Also automatic, requires no operator
Model 55, Model 62		60-350	C, M, P, G, T	1 - 1,000	Very high speed continuous motion production
Mercury Heat Sealing Equip. Strip-O-Matic with tablet feeder	Count	150-400	4-sided pouch (fin seal)	1 - 4	Complete automatic strip packaging. Excellent flexibility
Merrill Machinery Co. Merrill	Count	50-150	C, G, M, P	to 10,000	Tablets, capsules, bearings, nuts and washers
National Instrument Co. Filamatic Tablet Counter	Net	5-20	B, C, G, M, P, T		One tablet at a time accuracy
Pak-Rapid, Inc. Model T4	Counting plate	to 700	Pouches		Pills, tablets, capsules, candy, etc.
Plageman Enterprises, Inc.					
ASP	Vol.	20-50	B, C, G, M, P	1/300 - 2 oz.	Pills, tablets, capsules
PBC	Vol.	5-15	B, C, G, M, P	4 oz. - 1 lb.	
Popper & Sons, Inc. Tabcount	Count	5 - 80	C, G, M, P	5 - 500	Mechanical counting; visual inspection of tablets, capsules, small regular-shaped parts
Production Equipment, Inc. Div. of The Burnet Co.					
Triumph—TB 2, TB 3, TB 4	Count	1,500 - 3,000	B, G	to 10,000	Moderate production, great flexibility
Rotax	Count	Variable	B, C, G		Moderate production, great flexibility
U.S. Automatic Box Machy. Co. Crandall	Count	25 - 180	C, G, M		Varying counts and bottle sizes
Wrap-Ade Machine Co. Model UP11	Count	50-800	Forms, fills bags	Units, small multiples	Unit or strip packaging of tablets

FILLERS FOR LIQUIDS

MACHINE NAME AND/OR MODEL NO.	TYPE OF FILL GRAV., VAC., PRESS.-VAC. PRESS.-GRAV. GRAV.-VAC. PISTON, ETC.	SPEED RANGE UNITS /MIN.	CONTAINERS FILLED A-Aerosols B-Bags C-Cartons G-Glass M-Metal (cans, etc.) P-Plastic T-Tubes	FILL RANGE CAPACITY	BASIC FUNCTION, MAJOR USE OR MOST IMPORTANT FEATURE
Aidlin Automation, Inc.					
Aidling 300	Cylinder	35-2 gal.	A, G, M	½ pt.-2 gal.	Versatility and accuracy
Arenco Machine Co., Inc.					
Tube filler GAB	Piston	to 60	Tubes - (P and M)	½-240 c.c.	Closes metal tubes with special attachments
Twin head tube filler GAN	Piston	to 120	Tubes	½-180 c.c.	Automatic tube feed, electric-eye registration
Jar and can filler—GAM	Piston	to 25	Jars and cans	to 1 qt.	Versatility and accuracy
Bartelt Engineering Co.					
Automatic filler	Press.-Grav.	10-200	A, B, C, G, M, P	4 c.c.-10 oz.	Syrups, chemicals, slurries, suspensions, etc.
Biner-Ellison Mach. Co.					
Filabelmatic model A26		60 qt.	G, M, P	1 oz.-1 gal.	Low maintenance. Quick change-over. Very flexible. Filling, labeling simultaneously
Master filabelmatic G		20 gal.	G, M, P	1 oz.-1 gal.	
Brown Filling Machine Co.					
BFM Multiple Packeter	Piston-Vac. Vac.-Gravity	40-300	Pouches	0-8 oz.	Versatility. High speed pouch filling
Carbert Mfg. Co.					
Model 60	Piston	120	G, T (metal, plastic)	1/8-8 oz.	Extreme versatility. No splash effect
Chisholm-Ryder Co. of Pa.					
Series #5 (3 models)	Vac., Grav., Grav.-Vac.	1-50	A, G, M, P	Frac. oz.-2 gal.	Three basic models for all series: (1) vacuum fill for rigid containers, (2) gravity-vacuum for semi-rigid containers and foamy products, (3) gravity fill for odd-shaped or thin-walled plastic containers. Models available for different sized containers and higher speeds as indicated. Some models adaptable for in-case filling. All models adapted to bottom filling. All handle products from water-like viscosity to 1,500 centipoise. All models adaptable to handle highly corrosive liquids
Series #25 (3 models)	Vac., Grav., Grav.-Vac.	1-60	A, G, M, P	Frac. oz.-5 gal.	
Series #40 (3 models)	Vac., Grav., Grav.-Vac.	7-100	A, G, M, P	Frac. oz.-2 gal.	
Series #R612 (3 models)	Vac., Grav., Grav.-Vac.	5-150	A, G, M, P	1-5" dia.	
Series #H718 (3 models)	Vac., Grav., Grav.-Vac.	10-200	A, G, M, P	1-7-3/4" dia.	
Series #R836 (3 models)	Vac., Grav., Grav.-Vac.	20-400	A, G, M, P	1-5" dia.	
Arthur Colton Co.					
6	Piston	50-200	Paper cups, jars	¼-32 oz.	Dairy filler. Sour cream, cottage cheese
15 MS	Piston	12-25	A, G, M, P	¼-32 oz.	Universal low-cost filler
15 RF-2	Piston	20-50	A, G, M, P	¼-32 oz.	Med. output, bottom-up, universal filler
19	Piston	40-160	Glass and metal	¼-32 oz.	Cosmetic jar filler, with top-finished disc
19A	Piston	80-250	A, G, M, P	¼-32 oz.	High-speed bottle filling, bottom-up
172	Piston	20-100	P, T (plastic)	0-5.8 oz.	Plastic tube filler, sealer
175	Piston	20-85	Tubes	0-5.8 oz.	Metal collapsible tube filler
Cozzoli Machine Co.					
Line filler—LF and VR series	Piston	30-200	A, B, C, G, M, P, T	20 oz.	Bottom-up. Free-flowing, viscous, foamy
Asceptic filler	Piston	5-50	A, B, C, G, M, P, T	20 oz.	Asceptic filling
Model G F 1	Gravity		Glass and tubes	2 oz.	Free-flowing liquids in small containers
Crandall Can Filler Mach.					
Can filler	Grav., Press.	Various	Glass, cans, plastic	4 oz.-5 gal.	Products without solids. Top and sub-surface
Drum filler	Grav., Press.	Various	Drums and carboys		Top-fill and sub-surface types
Crown Cork & Seal Co., Inc.					
Cem-72 Uni-Blend	Press.-Grav.	550	Bottles	6½-16 oz.	Cap pre-blended liquids, soft drinks, wine
Cemco 50 Bottle Filler	Press.-Grav.	300	Bottles	6-32 oz.	Fill and cap beer bottles
Super Cemco-60 F.T.	Press.-Grav.	750	Cans	8-16 oz.	Fill open top beer cans
Cemac 28	Grav.-Vac.	175	Bottles	8-64 oz.	Fill and cap milk bottles
Crown-10	Piston	80	Cartons	8-32 oz.	Fill and seal Canco milk cartons
Detecto Scales, Inc.					
Barrel fillers	Air press.	20-40 secs.	Barrels	to 57 gal.	Weighs liquids any temp. or viscosity. Top fill for non-foaming; sub-surface for low viscosity
Dixie Cup Div. American Can Co.					
Model 1-DP	Pos. displace.	60	Round, nestable cups	½-1 oz.	Individual portions—cream, dressings, syrup
Economic Machinery Co.					
L-1000, S-1000	Displace. piat.	15-240	Aerosols: G, M, P	0-400 gm.	Aerosols; pneumatic operation; explosionproof
Elgin Mfg. Co.					
6 hd. non-stop filler	Vacuum	30-40	G, M, P	1-32 oz.	Cosmetic industry
10 hd. non-stop filler	Vacuum	50-60	G, M, P	1-32 oz.	
Visi-Measure filler	Gravity	100-120	Glass, metal	qt.-gal.	All liquids, particularly anti-freeze
Twin filler	Piston	40-50	A, B, C, G, M, P, T	1 oz.-gal.	Thin liquids (ether) to viscous (calkings)
Twin non-stop filler	Piston	60-80	A, B, C, G, M, P, T	1 oz.-qt.	Water to viscous
Quad non-stop filler	Piston	125-140	A, B, C, G, M, P, T	1 oz.-qt.	
Ertel Engineering Corp.					
Model EGR	Gravity	30-40	G, M, P	Min. neck openings 13/32"	All types of containers. Good for foamy products
Model ESA	Vacuum	40-60	G, some M and P	½-128 oz.	All around machine for glass containers
Model Pneumo-Vac	Vacuum	40-60	G, some M and P	8-128 oz.	Excellent for larger glass containers (gal.)
Portable vacuum filler	Vacuum	12-18	G, some M and P	½-128 oz.	All-purpose vacuum filler

Fillers for Liquids

MACHINE NAME AND/OR MODEL NO.	TYPE OF FILL GRAV., VAC., PRESS.-VAC. PRESS.-GRAV. GRAV.-VAC. PISTON, ETC.	SPEED RANGE UNITS /MIN.	CONTAINERS FILLED A-Aerosols B-Bags C-Cartons G-Glass M-Metal (cans, etc.) P-Plastic T-Tubes	FILL RANGE CAPACITY	BASIC FUNCTION, MAJOR USE OR MOST IMPORTANT FEATURE
Eyrle Company					
Fasfill 5-gal.	Vacuum	9	Glass	5 gal.	Demi-johns
Case filler	Vacuum		Glass	2 oz.-gal.	Fill in the case
Standard Siphon	Siphon	6-18	G, M, P	2 oz.-gal	
Filpaco Industries, Inc.					
Siphon filler	Grav., Siphon	4-20	G, M, P	oz.-gal.	Small, med. production; free-flowing liquids
FMC Corporation					
Canning Machinery Div.					
FMC Model 12	Vacuum	75-115	Cans	46 oz.-#10	Prevacuumizing cans of products and adding syrup or brine
Model 18	Vacuum	275	Cans	#202-46 oz.	
FMC Models 6, 10, 12, 18, 24, 28, 30, 36 valve filler-syruper	Gravity	25-650	M, G	6-46 oz.	For filling or syruping cans or glass to a headspare level
FMC Corporation					
Stokes & Smith Plant					
Stokeswrap	Piston	to 100	Forms, fills pouches	to 4 fl. oz.	Four-seal or pillow type pouch packages
Girdler Process Equip.					
Votator filler G6L, G9L, G12L, G18L, G27L, G36L	Gravity	75-425	Glass, metal	3-48 oz.	Fills desired head space. Free-flowing foods, industrials stressing accur., low maintenance at max. or reduced speeds. (See piston models in viscous fillers.) Speed depends on model
Votator filler G6G, G9G, G12G	Gravity	50-100	Glass, metal	46 oz.-5 qt.	
Glengarry Processes, Inc.					
Liquid scale	Gravity	10	B, C, G, M, P	8 oz.-25 lb.	Fill by net weight. Multi-head units available
Liquid scale (suspended)	Gravity	5	B, C, G, M, P	25-250 lb.	
Hedwin Corp.					
FM-3	Gross	to 20	Plastic	qt.-5 gal.	Collapsible cube-shaped plastic containers
Horix Mfg. Co.					
HA-HB-HE-HF	Gravity	to 600	A, G, M, P	3 c.c.-2 gal.	Accurate and versatile filling of liquids and semi-liquids. Wide range of liquids and various containers
HAS-HBS-HES-HFS	Gravity	to 700	Glass, metal	4 oz.-5 qt.	
HAV-HBV-HEV-HFV	Grav.-Vac.	to 245 qt.	A, G, M, P	2 oz.-gal.	
HBP-HAP-HFP	Pressure	to 500	A, G, M, P	2 oz.-5 qt.	
HAP-HBP-HEP-HFP	Press.-Grav.	to 650	A, G, M, P	3 c.c.-2 gal.	
HASP-HBSP-HESP-HFSP	Grav.-Vac.	to 750	Glass, metal	4 oz.-5 qt.	
TV (Portable)	Vacuum	6-36	Glass	oz.-qt.	
B	Gravity	to 60 qt.	A, G, M, P	to 2 gal.	
LG	Gravity	6-8 5 gal.	G, M, P	2-5 gal.	
Kahlenberg Globe Equip.					
106FP	Piston	40	G. M. P	0.02 c.c.-2 oz.	Small containers, two at a time. Foot-pedal
117 EM	Piston, Vac.	60	G, M, P	0-4 oz.	Automatic feeding; two containers at a time
157-A	Piston	60	G, M, P	0-50 c.c.	Filling, gassing, sealing vials, ampules
The Kartridg Pak Co.					
801 Ins.	Gravity	to 60	Aerosols	to 16 oz.	Cold filling of propellant. Most liquids
807 propellants	Piston, Press.	to 60	Aerosols	to 16 oz.	All propellants. Extreme accuracy
2051	Piston, Vac.	to 200	A, G, M	to 16 oz.	Most liquid products
1651	Piston, Press.	to 200	Aerosols	to 18 oz.	All propellants. Extreme accuracy
1951 Undercap propellants	Piston, Press.	to 200	Aerosols	to 18 oz.	All propellants. Crimps valve
The Karl Kiefer Machine Co.					
Pressure-vacuum 8-48 stations	Press.-Vac.	to 400	A, G, M, P	1/10 oz.-2 gal.	Nonfree-flowing: reduces evap.; balances internal pressure; all neck openings
Vacuum 8-48 stations	Vacuum	to 400	G, M, P	1/10 oz.-2 gal.	Restricted neck openings, also sprinkler top
Submerged fill 8-36 stations	Vacuum	to 400	G, M, P	2 oz.-2 gal.	For foamy products, whiskey, wines
Submerged fill 8-36 stations	Press.-Vac.	to 400	A, G, M, P	2 oz.-2 gal.	Foamy products. Low vac. Good for F caps
Pin Point 8-48 stations	Press.-Vac.	to 400	A, G, M, P	1/10 oz.-5 gal.	Plastic resilient-sided containers. No internal press. or vac.
Combination Pin Point-submerged fill 8-36 stations	Press.-Vac.	to 400	A, G, M, P	2 oz.-5 gal.	Most products; almost any container. Combined advantages—Pin Point and submerged
Aerosol pressure charging 2-36 stations	Pressure	to 400	A	0-514 c.c. or higher	Pressure charges all aerosols, liquid or gas propellants. Easy change, minute gas loss
Vari-Visco 4-12 stations	Metering pumps	to 400	A, G, M, P	5 c.c.-2 gal.	Vol. filler: foods, pharmaceuticals. Aerosols
Lynch Corp.					
Robo-Wrap	Piston	to 50/pump	Pouches	0-8 oz.	Auto. feeder for Lynch Robo-Wrap auto. pouch
MRM Company, Inc.					
Model B-4-6 spout	Vac., Grav.	20-24 pt., 10-12 qt., 2-3 gal.	G, M, P	to gal.	Dripless, quick cleaning, no manifold filling
Universal Vac.	Vacuum	40-50 pt., 20-30 qt., 6-8 gal.	G, M, P	to gal.	Auto. overflow. Simple change-over of sizes
Model GRC	Gravity		G, M, P	to gal.	Packless nozzles
Fully Automatic	Grav., Vac.	40-400	G, M, P	to gal	Overhead drive, ease of cleaning
T. R. Mantes Co.					
1626AP4MTFF	Grav., Press.	Two drums	Drums (55-gal.)	5-55 gal.	Air operated. Fills petro-chem products
2203AP4MCSSF	Grav., Press.	Two drums	Drums (55-gal.)	Various	Wgt. fill. Foam, non-foam. Edibles, corrosives, etc.

Fillers for Liquids

MACHINE NAME AND/OR MODEL NO.	TYPE OF FILL GRAV., VAC., PRESS.-VAC. PRESS.-GRAV. GRAV.-VAC. PISTON, ETC.	SPEED RANGE UNITS /MIN.	CONTAINERS FILLED A-Aerosols B-Bags C-Cartons G-Glass M-Metal (cans, etc.) P-Plastic T-Tubes	FILL RANGE CAPACITY	BASIC FUNCTION, MAJOR USE OR MOST IMPORTANT FEATURE
Mercury Heat Sealing Equip.					
Verti-Pak, liquid pump	Piston-Vac.	10-20	Bags (pillow type)	0-15 lb.	Grease, chemicals, etc. in unsupported film
Strip-O-Matic with pump	Piston-Vac.	40-300	4-sided pouch	0-100 ml	Bleach, detergent and other liquids in supported film
Pouchmaster with pump	Piston-Vac.	80-100	3-sided pouch	0-300 ml	
Geo. J. Meyer Mfg. Co.					
Meyer Dumore 24-8	Press.-Grav.	50-180	Glass	6.5-32 oz.	Crowner for beer-beverage ind. Other speeds
Meyer Dumore 72-12	Press.-Grav.	375-600	Glass	6.6-16 oz.	12-head crowner; pint only, beer-bev. ind.
Meyer Dumore 40-50-60-72	Press.-Grav.	350-600	Cans	10-24 oz.	All can fillers furnished for hookup to any seamer
60 Hi-speed	Press.-Grav.	790-900+	Cans	10-16 oz.	
National Instrument Co.					
Filamatic AB	Piston	85	A, B, C, G, M, P, T	0.03-50 c.c.	Free-flowing liquids, light oils
Filamatic DAB-16	Piston	60	A, B, C, G, M, P, T	0.5 oz.-1 qt.	Free-flowing, foaming liquids. Viscous, semi-viscous fluids
Filamatic Auto	Piston	200	G, M, P		
Packer Machinery Corp.					
PV-1	Vacuum		A, G, M (to qt.)	oz.-gal.	Interchangeable nozzles. Has own tank
PG-1	Gravity		A, G, M, P	oz.-5 gal.	Manifold or tank, interchangeable nozzles
PCF	Grav., Vac.		A, G, M, P	pt.-gal.	Fills containers in packing case
SFR	Gravity		Glass and metal	1-5 gal. cans	Bottom-up nozzles; very foamy products
PGP-1	Grav.-Press.		A, G, M, P	oz.-gal.	Grav. filler, centrifugal pump for press. fill
PVA	Vacuum		A, G, M (to qt.)	oz.-gal.	Fully automatic controls and conveyor
Pak-Rapid, Inc.					
Model FFL	Grav., Piston Pump	to 80	Pouches	8 oz.	Juices, beverages, all liquids
Perl Machine Mfg. Co.					
HF	Grav.-Vac.		G, M, P	frac. oz.-1 gal.	Short runs, variety of containers
BG, BOS	Gravity	50-80	A, G, M, P	frac. oz.-1 gal.	2-6 and 8-12 valves, foot-pedal operated
110A	Grav., Vac., Grav.-Vac.	20	G, M, P	5 gal.	No extra change-over parts needed for different size, shape containers
The Pfaudler Co.					
C-9	Gravity	110	Glass, metal	5 qt. max.	Most liquid foods—fruit juice, etc. Speed
C-24	Gravity	400	Glass, metal	5 qt. max.	depends on container size, product
Pneumatic Scale Corp.					
Samco Jr.	Grav., Vac.	5-40	G, M, P	1 oz.-1 gal.	Wide range of liquids and sizes
"All Purpose" filler	Choice of types	60-250	G, M, P	2 oz.-½ gal.	Uses gravity, vacuum, pressure or combination —on open-mouth or sprinkler-top ware
Popper & Sons, Inc.					
Perfektum VR-520Q	Piston	30-120	G, M, P	5 c.c.-4 oz.	Accurate. All types containers
Perfektum FPS-2, FSV-230	Piston	to 100	Ampuls, tubes, vials	1 c.c.-30 c.c.	Sterile fillers; full range injectable liquids
The Racker Co.					
Model SAF	Gravity, Press.-Grav.		30 or 55 gal. drums	to 750 lb.	Fill to net wgt. Auto. "dribble" and "final" cut-off
Model ATF	Gravity, Press.-Grav.		30 or 55 gal. drums	to 750 lb.	Auto. tare, "dribble" control, "final" cut-off, drum positioning
Saga Pkg. Mchy. Div. A & M Tool & Die Co., Inc.					
FS-22-P, FS-22-V	Piston	20-120	Plastic tubes	2 c.c.-21 oz.	Filling, sealing plastic collapsible tubes
FS-22-M	Piston	20-120	Metal tubes	2 c.c.-21 oz.	Filling, crimping metal collapsible tubes
FC-1, FC-2, FC-1-2	Piston	20-120	A, M, P	2 c.c.-21 oz.	Only aerosols: cans, plastic bottles, jars, etc.
Scientific Filter Co.					
"Scientific" Portable	Vacuum	2-20 gr.hr.	A, G, M, P	1 dm.-5 gal.	General bottling; all liquids; versatile
Models "A", "B", "C"	Vacuum	to 85	A, G, M, P	¼ oz.-5 gal.	Model C to 60/min., ¼ oz.-1 qt.
"Accu-Measure"	Piston	8-75	A, G, M, P	¼ oz.-1 qt.	Accurate. No overflow. Aerosols and plastic
Sealright-Oswego Falls Corp.					
Sealking Mod. 100, 300	Grav.-Piston	70	Cartons	8-64 oz.	Paper milk cartons. Mod. 300 fills ½ gal.
Tetra Pak Co., Inc.					
Tetra Pak	Grav.-Vac.	60-120	Tetrahedrons, cartons	½-32 oz.	Forms, fills, seals noncarb. and semi-liquid
Triangle Pkg. Machinery Co.					
R1	Grav., Piston	8-10	Canco paper bottles	½ pt.-qt.	
R4A	Grav., Piston	25-35	Canco paper bottles	½ pt.-qt.	Milk, milk products, fruit juices, etc.
R4SA	Grav., Piston	25	Sealright paper bottles	½ pt.-qt.	
U.S. Bottlers Machinery Co.					
Rotary Vac. filler NO- series	Vacuum	38-200	Glass, metal	4-12"	All units custom-engineered from basic models. All liquids. Handle min. dia. 1", max. vari-speed ratio 2 to 1
Model NA- series	Vacuum	15-300	Glass, metal	4-12"	
Model NC- series	Vacuum	20-400	Glass, metal	4-12"	
Model B-49	Vacuum	to 45	Glass, metal	1-14" high	Multiple. To 9 filling stems. Stainless steel and plastic available
Model B-59	Gravity	to 45	Glass, metal	1-14" high	
U.S. Siphon	Siphon	3-30	Glass, metal	Min.-gal.	To 8 s.s. filling tubes. Versatile; foamy
Wrap-Ade Machine Co.					
Model UPL	Piston	50-120	Forms, fills pouches	to 3 oz.	Hand creams, soy sauce, ketchup, mustard, etc.

FILLERS FOR VISCOUS PRODUCTS

MACHINE NAME AND/OR MODEL NO.	TYPE OF FILL GRAV., VAC., PRESS.-VAC. PRESS.-GRAV. GRAV.-VAC. PISTON, ETC.	SPEED RANGE UNITS /MIN.	CONTAINERS FILLED A-Aerosols B-Bags C-Cartons G-Glass M-Metal (cans, etc.) P-Plastic T-Tubes	FILL RANGE CAPACITY	BASIC FUNCTION, MAJOR USE OR MOST IMPORTANT FEATURE
Aidlin Automation, Inc.					
Aidling 300 B	Cylinder	35-2 gal.	A, G, M	⅛ pt.-2 gal.	Versatility and accuracy
Anderson Bros. Mfg. Co.					
55	Press.-Grav.	30	Cartons	½ gal.	½ gal. ice cream and sherbert cartons
175	Press.-Grav.	50	Cartons	Pint	Pint ice cream and sherbert cartons
C-2	Piston	25	Cups, jars, bottles, tubes	to 16 oz.	Wide variety of products
102	Pump gear	to 96	Cups, cartons	to 16 oz.	Ice cream
331	Pressure	250	Nesting round cups	3-32 oz.	Ice cream, sherberts
Arenco Mach. Co., Inc.					
Jar and Can—GAM	Piston	about 25	Jars and cans	to 1 qt.	Versatility and accuracy
Tube filler GAB	Piston	to 60	A, G, M	⅛ pt.-2 gal.	Versatility and accuracy
Bartelt Engineering Co.					
Automatic filler	Comp.-Auger	10-120	A, B, C, G, M, P	1 gm.-5 lb.	Paste products: especially soup base; also industrial compounds
Biner-Ellison Machinery					
Viscomatic—Model V8	Pressure	to 120 1 lb. jars	G, M, P	1 oz.-1 gal.	Simple operation; easy change; low maintenance
Brown Filling Machine Co.					
BFM Multiple Packeter	Moyno-Vac.	40-300	Pouches	0-8 oz.	Vers. High speed. Paints, jams, pastes, etc.
Carbert Mfg. Co.					
Model 60	Piston	120	G, T (metal, plastic)	1/8-8 oz.	Extreme versatility. No splash effect
Chisholm-Ryder Co. of Pa.					
718-VG	Vac.-Grav.	10-200	A, G, M, P	1-7½" dia.	Viscous products in rigid containers
836-VG	Vac.-Grav.	20-400	A, G, M, P	1-5" dia.	
Arthur Colton Co.					
15 MS	Piston	12-25	A, G, M, P	¾-32 oz.	Single, universal type, low cost
15RF-2	Piston	20-50	A, G, M, P	¾-32 oz.	Two-line, medium production, bottom-up fill
113	Piston & Gear Pump	20-50	Tubes	0-5.8 oz.	Collapsible metal tube filler and closer
150	Piston & Gear Pump	to 40	Tubes	0-5.8 oz.	Low cost tube filler; motorized gear pump
172	Piston & Gear Pump	20-100	Plastic tubes	0-5.8 oz.	Plastic tube filler, sealer. Durable production unit
185	Piston & Gear Pump	50-150	Tubes	0-5.8 oz.	Completely automatic tube filler. Durable production unit
Cozzoli Machine Co.					
Line filler LF and VR series	Piston	30-200	A, B, C, G, M, P, T	20 oz.	Bottom-up; free-flowing, viscous, foamy liquids
Asceptic filler	Piston	5-50	A, B, C, G, M, P, T	20 oz.	Asceptic filling
Detecto Scales, Inc.					
Barrel fillers	Air press.	Varies 20-40 sec.	Barrels	to 57 gal.	Weighs, fills liquids of any temperature or viscosity. Top fill for non-foaming liquids; sub-surface fill for low-viscosity fluids
Dixie Cup Div. American Can Co.					
2DP Extrusion model	Extrusion	30-100	Round nestable cups	3-16 oz.	Ice cream in single or multiple flavors
3DP	Piston	20-100	Round nestable cups	8-32 oz.	Cottage cheese, sour cream and moist foods
Elgin Mfg. Co.					
Twin filler	Piston	40-50	A, B, C, G, M, P, T	1 oz.-gal.	From thin liquids like ether to viscous like calking compounds
Twin non-stop filler	Piston	60-80	A, B, C, G, M, P, T,	1 oz.-qt.	Water to viscous. Quick change-over
Quad non-stop filler	Piston	125-140	A, B, C, G, M, P, T	1 oz.-qt.	
Model "H"	Piston	15-40	Metal	¼ pt.-gal.	Paint
Model "HH"	Piston	30-70	Metal	¼ pt.-gal.	
8-head rotary	Piston	100-125	C, G, M, P	4 oz.-qt.	Medium viscous products like oils
The Filler Machine Co.					
Universal model	Piston	20-200	A, C, G, M, P	3 oz.-gal.	Semi-liquids and semi-solids. Versatile. High speed
Model CF-60	Piston	20-60	Tubes	1/10 gal.	Oils, grease, pastes, putty, etc.
FMC Corporation Canning Machinery Div.					
FMC M&S 6P, 9P, 10P, 12P, 15P, 20P, 30P	Piston	75-800	Glass, Metal	2.2-155 oz. and 288 cu. in.	Wide range products and container sizes. Models 9P, 12P, 15P, 20P speed to 225. Models 6P, 10P also handle cartons
FMC Corporation Stokes & Smith Plant					
EG Filler, G-9	Auger	5-15	M, P, B, G, T	to 5 lb.	Auger packers for paste products

Fillers for Viscous Products

MACHINE NAME AND/OR MODEL NO.	TYPE OF FILL GRAV., VAC., PRESS.-VAC. PRESS.-GRAV. GRAV.-VAC. PISTON, ETC.	SPEED RANGE UNITS /MIN.	CONTAINERS FILLED A-Aerosols B-Bags C-Cartons G-Glass M-Metal (cans, etc.) P-Plastic T-Tubes	FILL RANGE CAPACITY	BASIC FUNCTION, MAJOR USE OR MOST IMPORTANT FEATURE
Girdler Process Equip.					For liquid, semi-solid and viscous pumpable food products, lube oils, antifreeze and other industrial products. Featuring "Magnetic Monitor" no-jam valve control and pneumatic no-container no-fill mechanism. Stressing accuracy, reduced maintenance, low operating costs at maximum or intermediate speeds. Speed range depends on model used
P6L, P9L, P12L, P18-P18L, P27-P27L, P36-P36L	Piston	185-1,200	A, G, M, P	3-48 oz.	
P6G, P9G, P12G	Piston	85-165	G, M, P	46 oz.-5 qt.	
The Globe Co.					
Globe-Fee #13865	Press., Vol.	20,000 lb./hr.	Boxes, cartons, buckets, drums	15-65 lb.	Processing and filling viscous products, particularly lard, shortening, margarine
#13812	Press., Vol.	40	C, G, M, Cans	½-10 lb.	
Special combination type filler #13873	Piston	34	Plastic tubes	0-1 lb.	Fill, close plastic tubes with metal closures
The Karl Kiefer Machine Co.					
Cadet Vari-Visco	Metering pump	to 100	All containers	5 c.c.-1 gal.	Positive displacement. No pistons. Accurate
Multi-stream Vari-Visco	Positive displacement	to 350	All containers	5 c.c.-1 gal.	Chunky products like chili-con-carne, etc.
Mono-Piston	Piston	to 35	A, G, M, P, T	½-32 oz.	Accurate; sanitary, easy cleaning, adjusting
Vari-Visco 4-12 stations	Metering pump	to 400	A, G, M, P	1/10 oz.-2 gal.	Vol. fill; no pistons; easy cleaning, regulating
Lynch Corp.					
Robo-Wrap	Piston	to 50 per pump	Pouches	8-16 oz.	Auto. feeder for Lynch Robo-Wrap automatic pouch machine
MRM Company, Inc.					
Model B-4-6 spout	Grav., Vac.	20-24 pt. 10-12 qt. 2-3 gal.	G, M, P	to gal.	Model B—dripless, no manifold filling, quick cleaning. Model GRC—packless nozzles. Automatic—overhead drive, minimum aeration, minimum overflow at high speeds. Three models used for syrups, egg shampoos, oils, creams and similar viscous products
Model GRC	Gravity	12 qt.	G, M, P	to gal.	
Fully Automatic	Grav., Vac.	40-400	G, M, P	to gal.	
Mercury Heat Sealing Equip.					
Strip-o-matic—liquid pump	Piston-Vac.	60	4-sided pouches	0-5 ml	Concentrated liquids. 3 M cement, lubricating jellies in supported film
National Instrument Co.					
FDS Piston Pump	Piston		A, B, C, G, M, P, T	2 c.c.-130 c.c.	Adapts Filamatic filler for viscous products
Pak-Rapid, Inc.					
Model FFL	Piston Pump	to 60	Pouches	8 oz.	Oils, paints, creams
Perl Machine Mfg. Co.					
700H	Piston		Tubes and jars	to 4 oz.	Very accurate fill for free-flowing liquids, viscous products, pastes, ointments
700P	Piston		Tubes and jars	to 16 oz.	
The Pfaudler Co.					
RP6-RPL6	Piston	150	G, M, P	to 46 oz.	
RP7-RPL7	Piston	100	G, M, P	to 5 qt.	
RP210-RPL210	Piston	300	G, M, P	to 46 oz.	
RP214-RPL214	Piston	400	G, M, P	to 32 oz.	Food products, lube oil, etc.
RP221-RPL221	Piston	500-600	G, M, P	to 16 & 41 oz.	
RP 35	Piston	860	G, M, P	16 oz.	
RP 36-RPL36	Piston	600	G, M, P	41 oz.	
Popper & Sons, Inc.					
Perfektum Series 840, 1640	Piston	30-200	A, C, G, P	¼-12 oz.	Precision; sanitary; free-flowing foamy and viscous drugs, cosmetics, soaps
Saga Pkg. Mchy. Div. A & M Tool & Die Co., Inc.					
FS-22-P, FS-22-V	Piston	20-120	Plastic tubes	2 c.c.-21 oz.	Filling, sealing plastic collapsible tubes
FS-22-C	Piston	20-50	Cardboard cartridges	to 16 oz.	Filling and mechanically capping grease and calking gun cartridges
FS-22-M	Piston	20-120	Metal tubes	2 c.c.-21 oz.	Filling, crimping metal collapsible tubes
FC-1, FC-2, FC-1-2	Piston	20-120	A, M, P	2 c.c.-21 oz.	Only aerosols (cans, plastic bottles, etc.)
Triangle Pkg. Machinery Co.					
DM-1, DS-2, D2A, DR-1	Piston	19; 50-60; 100-200; to 70	Round paper and plastic cups	2-32 oz.	Mainly cottage cheese; also salads, sour cream, etc. DR-1 includes cup dispensing, code dating, filling, capping viscous products

Choosing the right equipment

This check list presents the composite judgment of more than 60 production managers and other production executives as to what items should be considered when packaging equipment is to be purchased. The list originally appeared in a report issued by the Production Line Committee of the Packaging Institute and is reprinted here through the courtesy of that organization. Not all the check points will be applicable in every instance, but careful consideration of each item or factor will help assure the inclusion of all elements that should be covered when plans are made and orders drawn up for the purchase of new or replacement equipment for the packaging line.

A. Physical details

1. Name and model
2. Right- or left-hand operation
3. Materials of construction
   - Regular
   - Special for contact surfaces
   - Special for wearing surfaces
   - Special for pumps
   - Special for piping and valves
   - Special for gaskets
   - Other special requirements
4. Electrical requirements
   - Voltage, etc.
   - Underwriter's classification
   - Motors—Manufacturer
     - Capacity
   - Starters—Manufacturer
     - Capacity
     - Location
   - Switches—Manufacturer
     - Capacity
     - Location
5. Lubrication requirements
   - Fittings
     - At point of use
     - Central location
     - One-shot system
6. Safety features
   - State requirements
   - Local requirements
   - Plant requirements
7. Paint
   - Type
   - Colors
8. Special items
   - Shrouding
9. Auxiliary equipment
   - Variable speed drives
     - Speed range
   - Pumps
     - Pressure
     - Capacity
     - Type
   - Vacuum pumps
     - Vacuum
     - Capacity
     - Type
   - Clutches
   - Heaters
   - Counters
   - Indicators
   - Microswitches
   - Electronic controls
   - Timing dials
   - Tachometers
   - Other devices

B. Change parts

1. Quantity required
   - Individual parts, or sets
2. Marking
3. Interchangeability
4. Time required to change over
5. On delivered equipment
6. Shipped separately

C. Engineering data necessary for installation and interconnecting

1. Equipment
   - Floor plan
   - Elevation view
   - Assembled weight
   - Floor loading
2. Details of interconnection
3. Limiting factors affecting installation
   - Doorways and halls
     - Heights
     - Widths
   - Elevator capacities
   - Floor loads

D. Operational details and operational guarantee

1. Description of job expected
2. Speed of operation
3. Tolerances allowable
4. Efficiency expected
   - Defined as to speed
   - Defined as to period of time
   - Defined as to acceptable quality
5. Packaging materials to be used on equipment
   - Specifications
   - Samples
6. Materials to be packaged
   - Special precautions
7. Operators
   - Number required
   - Skill
   - Sex

E. Inspection and test at manufacturer's plant using actual materials

F. Delivery, installation and test period

1. Delivery date
2. Method of shipment
   - Rail—skid—knocked down
   - Truck—crate—assembled
3. Movement into position and uncrating
4. Installation
   - Supervision of manufacturer's engineer
   - Labor and materials by purchaser
5. Start up
   - Supervision of manufacturer's engineer
6. Instruction and demonstration
   - Of operation by manufacturer's engineer
   - To operators and mechanics
7. Test period
   - Time in which guarantee is to be met
   - Supervision of manufacturer's engineer
   - Cover change parts or special agreement

G. Manuals and data

1. Operating manual
   - Operating instructions
   - For specific model
   - Illustrated
   - Change-over instructions
2. Parts manual
   - For specific model
   - Illustrated
   - Change parts included
   - Parts stocked by manufacturer
   - Assembly drawing
3. Wiring diagrams
4. Lubrication manual
5. Data for timing charts

H. Guarantee by manufacturer against

1. Defective workmanship
2. Defective materials
3. Patent claims

I. Maintenance spare parts

1. To be delivered with equipment
2. To be shipped separately

Collapsible-tube fillers

by H. Cecil Edgar*

While the practicality of collapsible metal and plastic tubes well justifies their popularity, problems do arise because no one machine will efficiently and economically fill all products packaged in tubes. (See filling machinery chart in this section.)

For example, fluids which are very thin and elusive can be handled only on high-precision filling equipment designed with the closest possible tolerances in piston and valve to prevent leakage and maintain accuracy of fill. Accurate seating of the valve in the nozzle is essential, and tubes must be folded and sealed so as to maintain a leakproof closure.

At the other limit of the product range are heavy materials such as caulking compounds, beauty clays and certain adhesives. These in some respects are more of a problem than the thin liquids. The first two are difficult to fill into tubes in accurately metered amounts without trapping air. Therefore, special equipment is needed.

Some adhesives also create problems because they have a stringing tendency—meaning that a "string" of the material remains between the nozzle and the filled tube and must be broken. Sometimes a "blow-off" or jet of compressed air on the filling nozzle will break this string, but there is no one remedy to meet every situation of this kind. It is sometimes necessary to wipe the nozzle and jaws of the filling machine periodically.

These extremes in tube filling are mentioned only to point up the fact that the requirements in tube filling are such that no one machine can solve them all. Special equipment often must be specified.

When you consider that, on the average machine, filling is done in approximately half a second and the tube-folding operation done in half that time or less, it is apparent that this equipment must be precision built and of rugged construction.

Between the two product extremes —thin liquids and viscous products— are the intermediate materials such as shaving creams, hand creams, light toothpastes, paste cheeses, salad dressings, ointments and similar preparations, which all have about the same paste consistency and which, when filled on good equipment, present no special problem whatever.

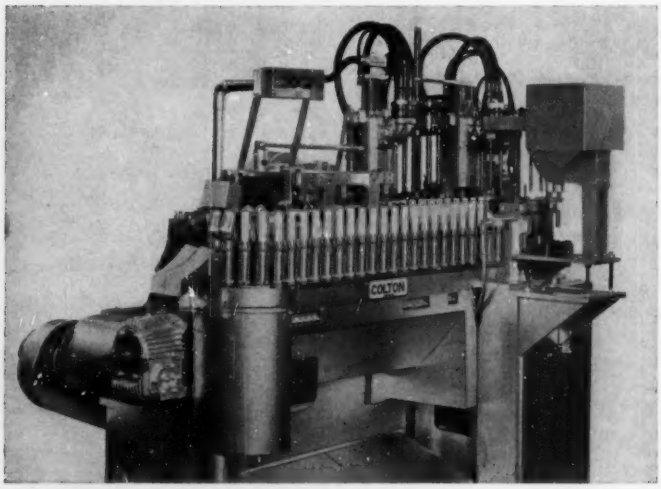
Proper closure of the tube is just as important as the filling of the tube. Just as you have different kinds of materials to be filled, so, too, you have different kinds of tubes. Tin, lead or aluminum tubes with varying wall thicknesses and grades of hardness present different problems in proper closing. (See also article on p. 335.)

Whether you want a double, a triple or a quadruple fold will depend a great deal on your choice of tube. Dating or coding of filled tubes is also a matter of choice, as is the design or type of crimping on the closed end of the tube.

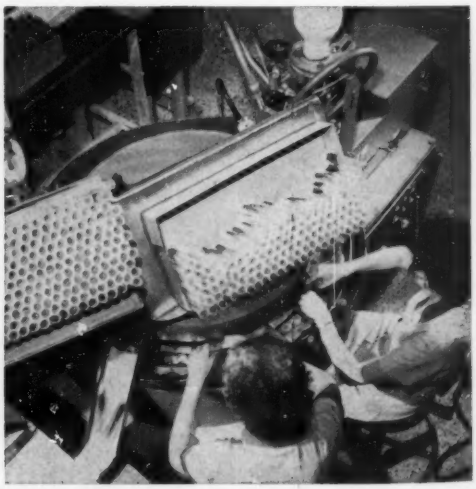
Production aims vary a great deal between manufacturers and between products. It is the responsibility of process and production engineers to know the scope and variety of machines available, so that they may specify intelligently machines which have been engineered to the major requirements of each filling project.

High-speed automatic filling units. In this land of large and growing population and big consumer markets, there are production plants with whole batteries of high-speed automatic machines which fill a single product—perhaps a popular toothpaste, shaving cream or hair tonic. These special

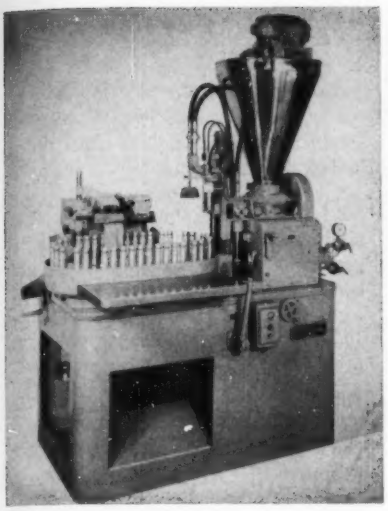
* Chief Draftsman, Arthur Colton Co., Div. of Snyder Corp., Detroit, Mich.



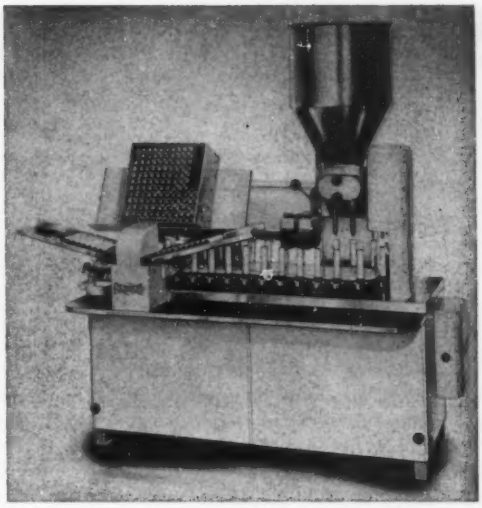
HIGH-SPEED collapsible-tube filling machine has a precision-type index mechanism that positions tubes for filling and closing. This unit, which features rugged design for high-speed production rates on a modern packaging line, is installed at Lever Bros.' plant, filling Pepsodent's Stripe tooth paste. (*Arthur Colton photo*)



CONTINUOUS ROTARY machine vacuum cleans, fills and seals 120 polyethylene tubes a min. with Procter & Gamble's Prell shampoo. (*Machine, Saga Packaging Machinery Div., A & M Tool & Die Co.*)



CONVERSION unit makes it possible for this metal tube filler to handle plastic tubes as well. Sizes to 1¾ by 7¼ in. and speeds up to 85 a minute. (*Arthur Colton photo*)



DUPLEX tube filler has automatic feed of the tubes, photo-electric registration of print. Cleans tubes, tightens caps and codes up to 120 a minute. (*Arenco Machine Co. photo*)

automatic high-speed machines take the shipping containers of tubes, remove the tubes, load them into tube holders, tighten the caps, align the name panel on the tube (by means of an electric eye), fill the tubes, fold the ends with a quadruple fold, crimp them and transfer them to the intake of a cartoning machine which places each tube, with or without literature, in its own individual carton. The cartoner is driven by, and is also completely timed with, the automatic filling machine.

That's the picture of high-speed filling as it may be seen in dozens of great plants today, with completed tubes being turned out of single machines at speeds from 160 to 180 a minute. However, there are many plants which also fill mass-volume products, but which emphasize the machine features of high production and versatility. In these plants, machines must be readily switched from one product to another and from one size to another in a minimum of time.

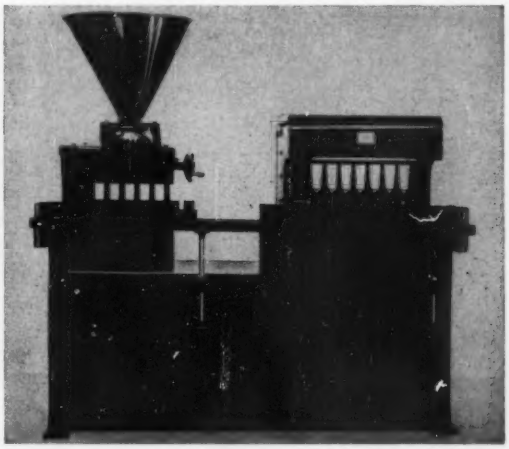
Standard semi-automatic machines. This equipment is, and has been for years, the mainstay of tube users, large and small. An operator takes the tubes from the supplier's carton and places them in the machine, where they are automatically filled, closed, crimped and ejected. Most of these machines have been brought to a high degree of perfection.

Many kinds of supplementary equipment are available, such as water-jacketed heated hoppers for handling materials that tend to thicken, and agitators for materials that tend to settle. These machines handle a wide variety of tube sizes at rates ranging up to 110 tubes a minute.

There is also a large market, both here and abroad, for hand-operated and motorized tube fillers which turn out from 20 to 40 tubes a minute. These fillers meet the need for machines geared to a limited production which would not justify investment in higher-capacity equipment. They are used with supplementary tube-closing and tube-crimping equipment and they may be either hand operated or motorized.

Obviously, with such a range of equipment at his disposal, the buyer can and should ask himself which particular models most closely meet his immediate and prospective needs. Is production good enough to go beyond the hand-operated type of machine? Is there assurance of long, continuous runs that would justify installing high-speed special automatics? Is there enough volume to warrant a standard or semi-automatic machine which can be switched from one product to another? Should machines be chosen for their adaptability and for the availability of special equipment such as: high-precision metering cylinders; tube cleaners; cap tighteners; a stirring device; a water-jacketed hopper, electrically heated and thermostatically controlled; a no-tube-no-fill device; a heavy-duty pump; special tube holders; a delivery conveyor belt?

As for service, long-established, reputable filling-machine manufacturers maintain large stocks of standard replacement parts and most machines can be serviced by the user's own maintenance department. It is also important that the manufacturer have service engineers available.



PLASTIC TUBES are filled on semi-automatic machine that requires one operator to fill tube rack. Output is rated at 15 to 20 filled and sealed tubes a min. (*Photo, Carbert Mfg. Co., Sub., Pneumatic Scale*)

FILLING BY COUNT

by Gene Lakso*

Packaging by count is a field of growing interest. Pharmaceutical manufacturers have packed tablets and capsules by count for years and packaging some hard goods items this way is traditional. There is evidence, however, that rising costs are forcing many other packagers to pack candy, gum and other articles by count. Take, for example, the case of a candy manufacturer with a package containing an average of eight pieces. A weight or volume tolerance may produce a package with nine pieces, this extra piece often representing more than the profit on the package. Also serious is the situation when a purchaser finds only seven pieces in a package intead of the usual eight.

Packagers of tablets and capsules also are expanding their use of counting equipment to fill bulk counts of 500, 1,000 or 5,000 units. The resultant accurate fill eliminates costly overfilling by weight.

The following remarks are concerned only with machines that feed the product so it can be counted, and then discharge the counted articles into a container. We, therefore, are discussing a packaging machine rather than simply a counting mechanism or device. The counting of bottles, boxes and the like on a production line is not included; only the counting and packaging of small articles such as screws, tablets and capsules. (See also chart "Guide to Basic Types of Filling Machines" in this section.)

The various types of available machines generally have been classified into three major groups and today one finds that no new equipment has been developed to justify a fourth major category. Tremendous changes and improvements have taken place in all three types of machines, however.

Basic types of machines

1. *Board or disk type.* These can be thought of as a mechanization of the hand paddle. A moving plate, disk or slat, with a definite number of holes or recesses of the proper size and shape to receive the product, passes beneath a mass of tablets. Each hole picks up one tablet and the excess is then allowed to slide off or be wiped off. As the disk or slat continues to move, tablets drop through a cut-off or fall out of the slats into bottles. These machines are available as rotating disks, linear motion slats with holes, or vibrating and tilting manually operated boards.[1]

2. *Column counters—count by measurement.* These feed the articles into a channel, and the channel is so designed that the articles are contained in a single row. The channels usually are grouped to form a series in either a vertical or inclined position. The length of the column in the parallel channels determines the count. This count is pre-set by a hold-back pin in the column. While holding back part of the column, the preceding group is released into the bottle.

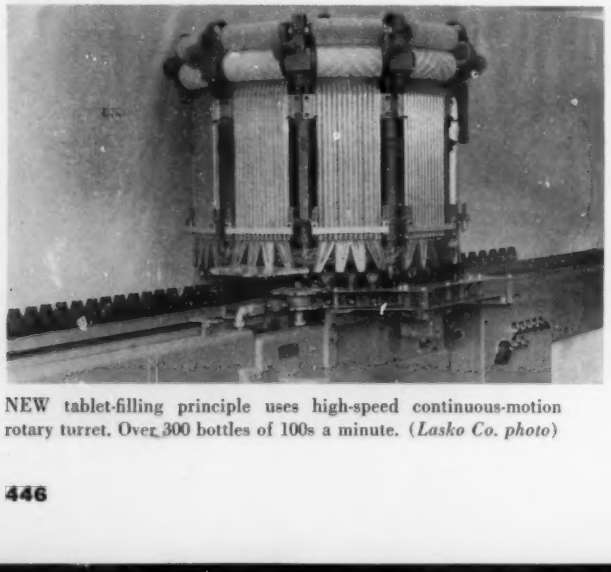
3. *Unit or individual counters.* These machines accomplish counting in two basically different ways: mechanically and electronically. The mechanical machine uses a group of channels in which counting wheels are placed. The wheels are so attached that the predetermined number of pockets in the wheel and the revolutions of the counting wheels combine to provide the correct tablet or pill count. The electronic counting is accomplished by sending the articles past a light beam in a single stream with a space between each article. The interrupted light beam then acts through a photocell and a predetermining electronic counter, and when the predetermined count is reached the product flow is diverted to another container or a small batch hopper.

The disk machines originally were available for hand feed of bottles or for automatic feed of one bottle at a time. Machines are available now to fill two at a time and speeds have increased considerably, especially on items that tend to slide and fill well on this type of machine.

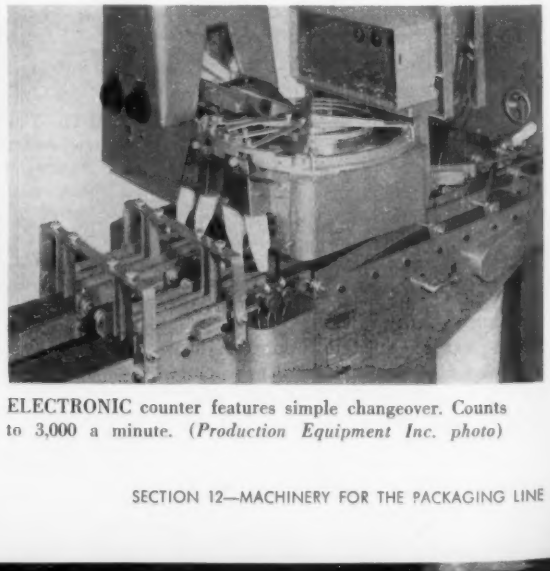
The machines with slats were made wider in recent years to provide higher filling speeds, but the user was then faced with the problem of glass tolerance which would accumulate

* The Lakso Co., Inc., Fitchburg, Mass.

1 See "Low-Cost Packaging Line," MODERN PACKAGING, Feb., 1961, p. 90.



NEW tablet-filling principle uses high-speed continuous-motion rotary turret. Over 300 bottles of 100s a minute. (*Lasko Co. photo*)



ELECTRONIC counter features simple changeover. Counts to 3,000 a minute. (*Production Equipment Inc. photo*)

when a group of bottles was stacked in a straight line. The accumulated error often would place the end bottles out of reach of the filling funnels. Newly designed bottle locators, to eliminate this problem, now are available on these machines. Straight-line column machines also are available with bottle locators.

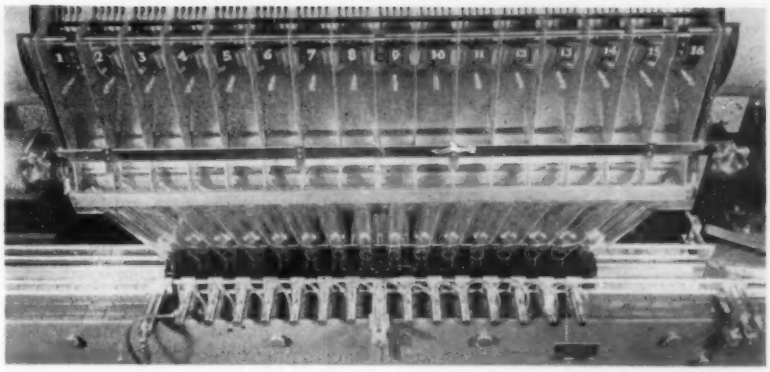
Mechanical column counters employing a channel have improved considerably in recent years in the handling of soft, dusty and fragile products. Dust-collecting systems and auxiliary sifting and feeding devices have helped greatly to improve packaging efficiency.

Perhaps the most significant improvement in the field of column machines is the use of the rotary turret method of filling. The rotary machine consists of a series of vertical channels placed around a rotating turret. This principle increases capacity without increasing floor space and also offers the speed advantage of continuous motion. Now available are machines that fill bottles of 100 count at more than 300 bottles a minute. These machines also eliminate the bottle tolerance problem because individual pockets handle each bottle as it passes through the filling arc. The rotary machines are extremely fast but they usually are limited to the handling of one or relatively few products because change-over is rather lengthy and expensive.

Unit counting, especially electronic counting, has seen the most dramatic change in recent years. The electronic counter has become a major principle in the development of machines to package by count. Improved dependability of the counting units and their components has helped make them a practical piece of equipment.

Why have suppliers of counting and filling machines spent much time and money to develop an electronic counter? The answer is two-fold: flexibility of equipment and capacity to operate without an attendant.

The electronic counters handle wide ranges of sizes, counts and shapes without additional heavy investments in change parts, plates, disks and boards. Theoretically the electronic counting machines offer the greatest potential to the producer with a wide range of product sizes and shapes, and there are now a significant number of plant installations which attest to the fact that the long-sought-for goal is a practical reality.



AUTOMATIC BOTTLE LOCATER positions bottles ranging from 10cc to 250cc under filling spouts of this two-row, wide-slat, continuous-fill counter. Speed: to 150 bottles, 100 count, a minute. (*Merrill Machinery photo*)

The second important feature of electronic counting is efficiency. Although disk, slat, column and rotary machines often are classed as automatic they simply cycle automatically and very rarely are they in use without an operator in attendance. The disk, board and slat machines usually must have an operator in attendance to insure that all holes are filled to avoid a miscount; and column and mechanical counting machines also have an attendant to watch for full count and to clear the tracks in case of a serious jam. Electronic counters do not require such monitoring.

However, up to the present, electronic counters have had one serious limitation in that they could not match the speeds of the older types of counters. Electronic machines are limited in that rarely can a pharmaceutical tablet be fed faster in a single stream than at a rate of 2,000 a minute. This results in a relatively low filling rate—for example, 20 100-count bottles a minute. This limitation is successfully overcome by adding more feeding channels, each equipped with a photoelectric cell and counter. Although such multiple-track machines are expensive the installation is economically justified by the savings in change parts and change-over time, the elimination of an operator, and the capacity to handle a new product immediately without purchasing parts on long delivery. Multiple-track machines now are rapidly reaching a high state of development and it appears that soon they will be capable of meeting moderate to high-speed production requirements. It is doubtful, however, that the electronic machines will reach the speeds attained by the rotary filling machines currently in use for high-volume items.

Supplier-purchaser relationship

The purchaser must remember, first, that the production rate of any tablet-counting and -filling machine on any package is inversely proportional to the count per package. For example, a package of 50 tablets will fill faster on any machine than the same tablets packed in a bottle of 100.

The ideal product and package for counting machines of the type described consists of a hard, round spherical object like a ball-bearing packaged in a wide-mouthed, round metal container. With such an ideal product and package a supplier could justly advertise fantastic filling speeds. On the other hand let's consider the difficult case of a package that consists of an oval bottle with a small neck finish into which must be packed 250 large tablets with square edges that tend to chip and powder very easily. These two cases show what extremes exist. Finding the right answer between the extremes is a problem that you and the machinery manufacturers must attack together. When a given production rate is sought for a specific package, the machinery supplier should have an opportunity to examine and test the completely finished package. To the untrained eye "a pill is a pill" but there is a tremendous difference in performance on a counting and filling machine between two items or packages even though the difference appears small and insignificant.

Capping and sealing equipment

by E. L. Kuhn*

Capping equipment as such is not new. But it encounters new problems.

Long accepted as essential in the packaging line for glass and tin containers, capping units for these lines include standard machines for applying both metal and plastic continuous-thread caps, side-seal closures and lug-type caps. New equipment or adaptations of existing machinery, appearing during recent years, resulted in the availability of screw cappers for vacuum capping, for injecting nitrogen and other gases in the head space prior to capping, and for sorting and applying many new captive cap- and dispensing-type closures. Polyethylene closures now available which produce a tamperproof seal also are handled automatically at high speeds, on modifications of previously designed capping machinery.

Among the new problems is one of orientation as well as application and this often means a more complex design. The universal capping machine has yet to be designed, but versatility is increasing. Already, higher-speed machines for various operations in an aerosol line have been introduced by capping machinery manufacturers; they include equipment to sort and apply valves, to sort and apply actuator buttons, and to sort and apply the protective overcap. There are units that will sort and apply corks as well as caps, snap caps as well as threaded closures, and threaded closures as well as Newman seals (reamed-in metal-to-metal plug-type seal commonly used on olive-oil cans and on bottom of square anti-freeze cans). There is a continuous demand for more versatile equipment, including dual-purpose machinery of all kinds.

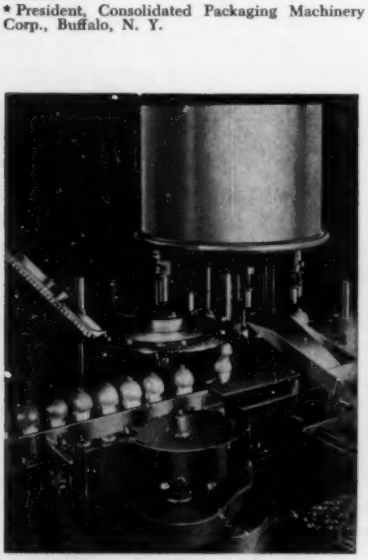
The growing popularity of polyethylene containers and closures presents a new set of problems, stemming from the fact that the flexible containers must not be gripped too tightly or they will be permanently distorted when capped. The many varieties of flip-top or turret-type closures also necessitate the design of special handling parts and chucks. One new factor is the availability of equipment to sort these nonbreakable bottles, some of which are currently being shipped in large polyethylene bags. The possibility of sorting or orienting these from a mass supply now permits companies to further mechanize their lines and thus reduce labor costs.

With more experienced packaging and maintenance engineers available today in the plants of capping machinery purchasers, optimum results and top efficiency standards are being consistently maintained. Trends indicate that the next five years undoubtedly will bring increased use of steam vacuum cappers designed for the handling of lug or quarter-turn caps. Vacuumizing of containers taking continuous-thread caps may also be done.

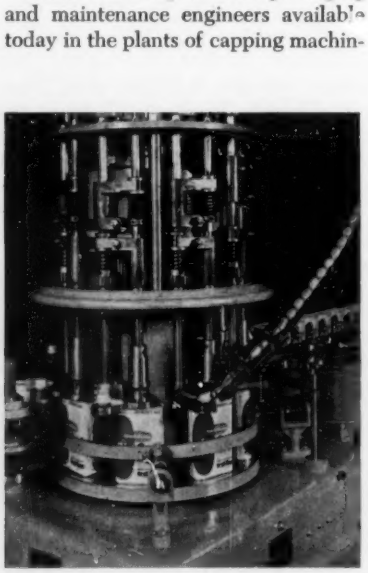
Achieving higher speeds always has been a challenge to the machinery manufacturer. Baby foods and ketchup have for years been packed at line speeds up to and sometimes exceeding 650 units per minute. Other industries are recognizing the cost advantage of these higher speeds and have moved well beyond the 120-per-min. standard that was considered as "high speed" for many years. Containers that must be held or kept from turning during application of a pre-threaded cap and closures threaded on after being applied make these higher speeds more difficult to attain; but the obstacles these presented have been overcome and a number of machines are available for speeds of 200 to 300 and over. In many cases the limiting factor has been the speed at which the larger closures, such as 70 mm. and above, could be effectively sorted.

The selection of a capping machine is dependent on many individual fac-

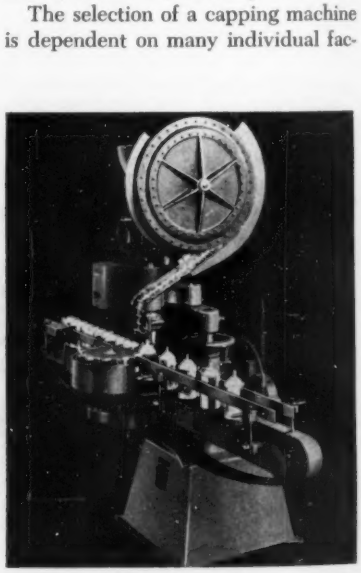
* President, Consolidated Packaging Machinery Corp., Buffalo, N. Y.



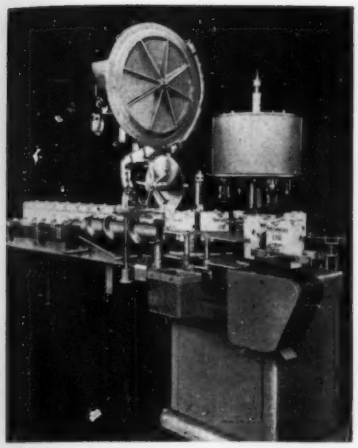
PLUGGING unit sorts and inserts dispenser fitments into polyethylene container held in position by plastic cones in standard juice can; 225 or more fitments a min. (*Consolidated Packaging Machinery photo*)



CAPTIVE CAPS are being sorted, oriented and applied to "F" and "I" style cans. This type of cap has grown in popularity because it prevents cap switching in stores. (*Consolidated Packaging Machinery photo*)



AEROSOL VALVES (less dip tubes) are sorted and applied by this unit to standard aerosol containers for food topping. Operates at speeds of from 110 to 120 a minute. (*Consolidated Packaging Machinery photo*)



VERSATILE machine applies Newman seal with pull-up, no-drip plastic pouring spout; 60 closures a min. on 1-gal. cans. Applies screw caps to cans, glass containers. (*Consolidated Packaging Machinery photo*)

tors including shape, size and height of container, amount of removal torque required, number of bottle and cap sizes to be handled, present or possible future interest in applying closures other than threaded caps, nature of product packed and dependability of machinery manufacturer for service and spare parts. Operating speed of a line also determines the type and size of capping machine.

Where a customer is faced with a variety of sizes to be packed in short runs, the straight-line machine is frequently the best recommendation. With this type the initial cost of machine and parts is lower, but maintenance, required machine adjustments and supervision in general are greater. Where a limited number of sizes is operated with long runs or where odd shapes, low jars, polyethylene containers or larger closures are used, the rotary-type machine, with parts for different diameters of cap and container, is preferred. In the latter case parts for a specific size are fitted before shipment by the manufacturer. This approach, eliminating risk of human error, reduces the number of adjustment and trial runs required during change-overs.

Recent improvements have made the straight-line machine more versatile. It now has been adapted for inner-sealing cans, as well as for applying patented caps such as the "U-Pressit" design and the Newman-spun closure, and for vacuum packing with pre-threaded closures. On the other hand, rotary machines can also be designed for corks, with the one machine capable of both sorting and inserting wood-topped corks. The design also can handle snap caps, plugs for squeeze bottles, certain shields and touch tops used on aerosol cans, as well as metal can breasts—these being the top section or shoulder top of cans for face, tooth or baby powders.

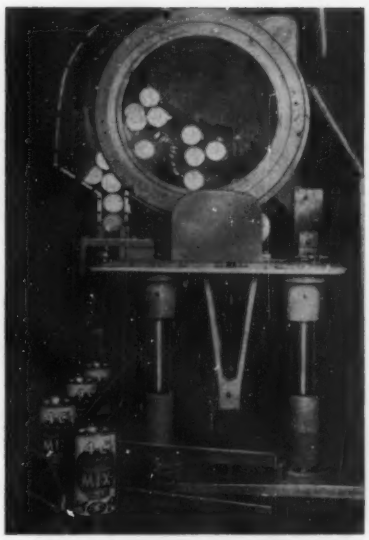
Many of the above machine adaptations are modifications of standard machines and at times are not covered by sales literature. If special capping operations are required, the engineers involved should contact the various capping machinery manufacturers to determine whether the problem can be dealt with by using standard equipment slightly modified.

A typical line installation of capping equipment can be made using three distinct approaches. The most common procedure involves purchasing each of the component machines as self-contained units and then employing either a crossover or end-to-end transfer. Butting of individual conveyors end to end has an aesthetic appeal but, because of the dead plate length usually required, this method has serious shortcomings when either light, unstable or extremely large containers are operated. The crossover transfer necessitates overlapping successive individual conveyors and bending the conveyor guide rails to guide the bottles or cans from section to section.

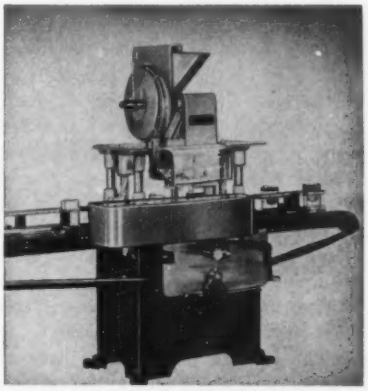
Prior to installation, it is wise to submit a preliminary line layout to all manufacturers who are going to supply equipment so they can eliminate any obstructions on lapping side of both intake and discharge conveyors.

A second type of packaging line is designated a straight-through hookup, which again requires certain liaison between the various machinery manufacturers. In this approach a common chain is threaded through the machines involved and driven by a separate conveyor drive unit at the discharge end. Unit conveyors are squared off so attachment to the preceding and following machine conveyors can be readily accomplished.

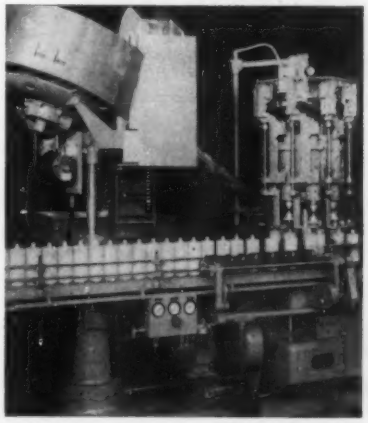
A "synchronized line" is the third approach and with this method all components of the line, including the conveyor, are driven from a common line shaft. Many individual machinery manufacturers are prepared to furnish machines for a packaging line of this kind by virtue of their experience with the associated equipment and their ability to obtain the necessary engi-



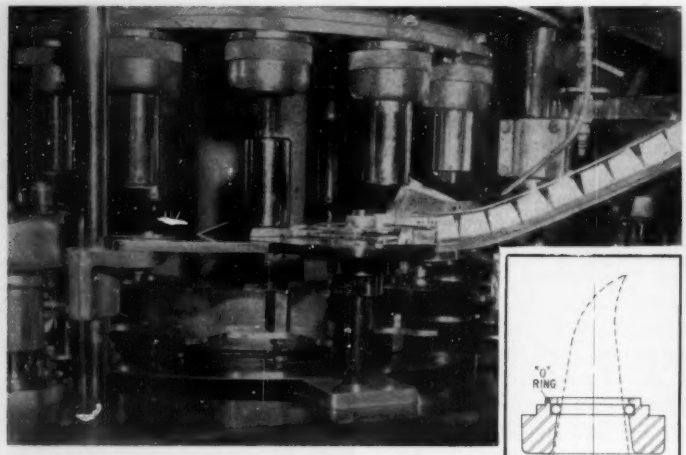
MAGNETIC capper. Rotary capping heads pick up caps by magnetic attraction, push them firmly into cans. (*Resina photo*)



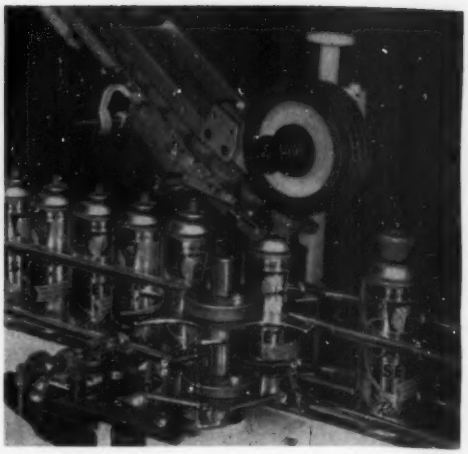
SORTING, feeding, application of inner seals achieved automatically by this unit at 60 to 120 seals a minute. (*Resina photo*)



HIGH-SPEED rotary capping machine has four-speed air chuck drive and escalator cap lift. (*Pneumatic Scale photo*)



SPECIAL DESIGN for Abbott Labs' trylon, other odd-shaped caps. Chuck with floating rubber "O" ring adjusts to cap dimensions. Teflon strips and silicone lubricant in feed chute reduce friction and minimize tendency of taper caps to wedge and jam. (*PMC Industries capper*)



OVERCAPPER for aerosol containers. Conveyor and star wheel move continuously to push containers through cap-chute release point. As shown, each container picks up its own closure; moves under wheel which seats cap. Up to 200 containers a minute. (*Pneumatic Scale photo*)

neering data. Regarding any of these hookups, it is wise to specify the width and make of conveyor chain.

Capping equipment is normally installed after the filling machine and in turn is followed by the automatic labeler. However, where a roll-on label is used, the container is labeled empty and the labeling machine is installed ahead of the filler. In this latter case it is important that manufacturers of both filling and capping equipment be so advised so they can design their machines to reduce contact on freshly labeled containers.

The amount of conveyor between machines depends on the size of containers to be handled and the packaging speed. The exception is the synchronized line which can function with no space between components. This saves space, but makes maintenance difficult and prevents the operation of other units in a line when one close-coupled unit needs repair.

Capping or sealing equipment invariably includes automatic sorters which may be a part of the machine or located in another area with caps conveyed to the machine by long chutes or a conveyor chain. This latter arrangement is sometimes used to eliminate the noise caused by large metal caps being dropped.

The sorting hoppers themselves are normally filled by an operator and in some cases the capacity of the hopper can be increased by the use of a sheet-metal hopper extension. In other cases, available floor space above the hopper permits the use of a floor bin of large capacity connected to the sorter hopper by a duct or large diameter pipe. With this arrangement the head load of the bin must be directed away from the sorting wheel and to the rear of the hopper. It is also possible to obtain an elevating conveyor of either the bucket or magnetic belt variety that will conduct the caps from a floor bin to the sorting hopper.

Other types of special capping equipment of note include vacuum-capping machines being introduced by many cap manufacturers to handle their own particular closure type. Many such units can be adapted to other brands of closures and, depending on the sale or leasing contract, can enable customers to use more than one source of cap supply.

The "roll-on" tamperproof seal is a special closure involving specific equipment. New companies have entered the field with special machines for the handling of odd-shaped closures including dauber applicator caps. This depends on a sorting technique that specialized capping equipment manufacturers have developed.

Capping and sealing equipment is designed to apply a closure or seal made by one supplier to a container frequently purchased from a different supplier. When this is the case, be sure that the manufacturing tolerances of one component do not exceed those established for the other, since they must be fitted together mechanically. A cap that cannot be applied to a jar by hand because of maximum glass and minimum cap dimensions is not going to be handled satisfactorily by machine at high speeds. And, poorly designed or thin-wall plastic caps that break with hand application will break more often applied automatically.

The most important single item on a capping machine from the point of view of maintenance is the chuck or tightening roll. New techniques in the rubber and plastic field have improved the operation of this component by limiting wear to a replaceable face or ring. Knowledge of torque requirements and the nature of the product will help in choosing the proper material for the ring. Nevertheless, chuck and roll inspection and maintenance should be frequent.

The machinery builder should be told if the product is such that the machinery must be hosed down during clean-up periods. Electrical components of the proper type can then be provided which may or may not involve an upcharge.

As higher speeds are attained, it becomes desirable to specify brake motors on the main machine drive. This eliminates coasting and excessive breakage in case of a machine jam.

Some capping machinery customers specify that the sorting equipment must automatically cut off when the machine is stopped. This reduces abrasion and wear on the caps. Raw edged, unbeaded metal closures are especially subject to damage caused by contact of cap against cap. Also, a poor enamel finish on metal closures or a substandard gilt finish on a plastic closure may result in scratching or marring.

Sundstrand Packmasters

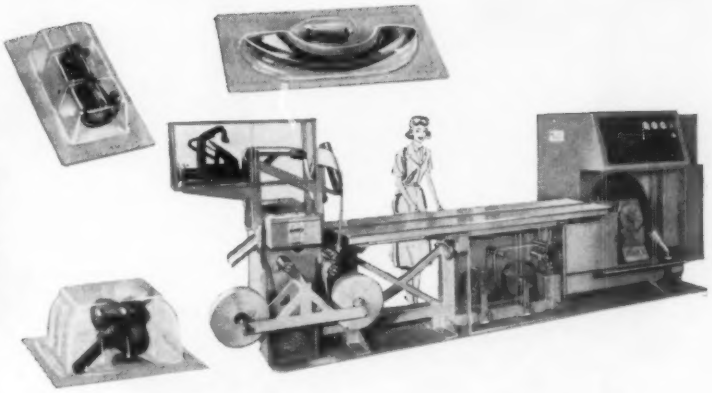
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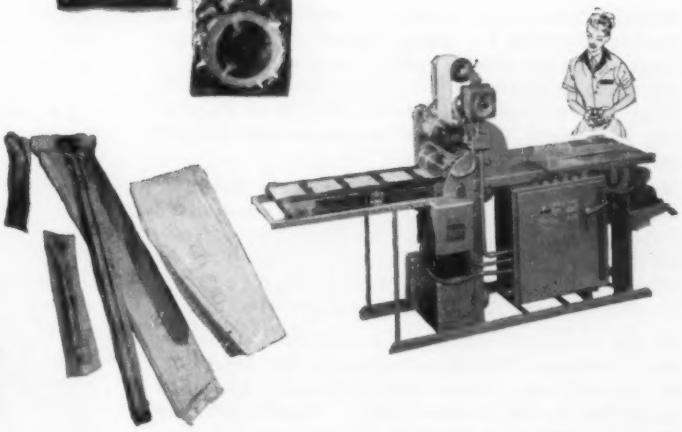


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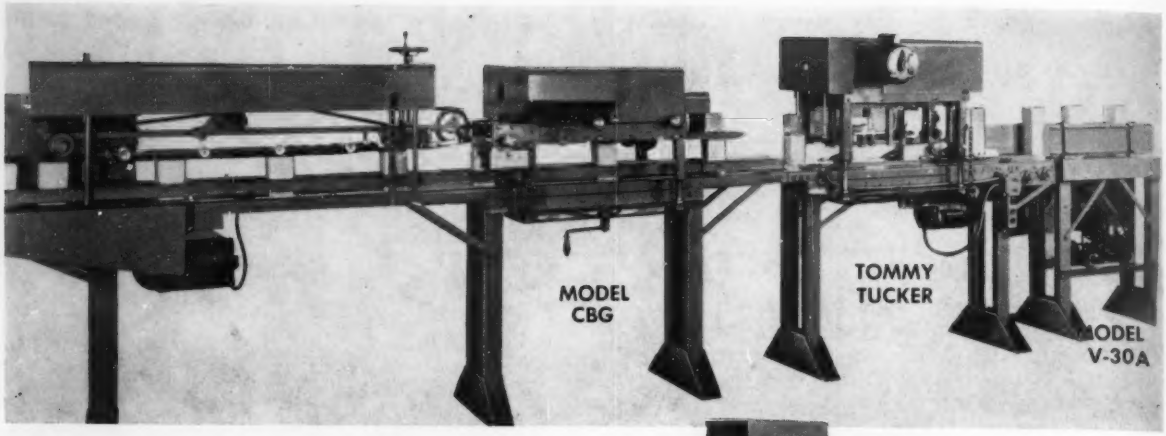


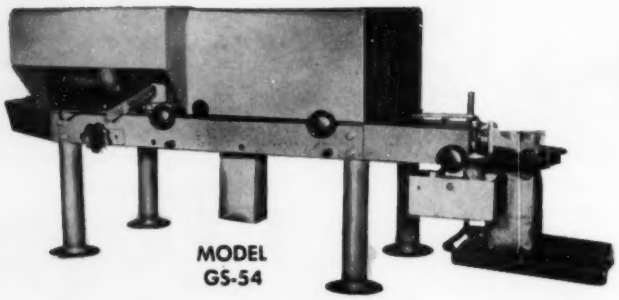
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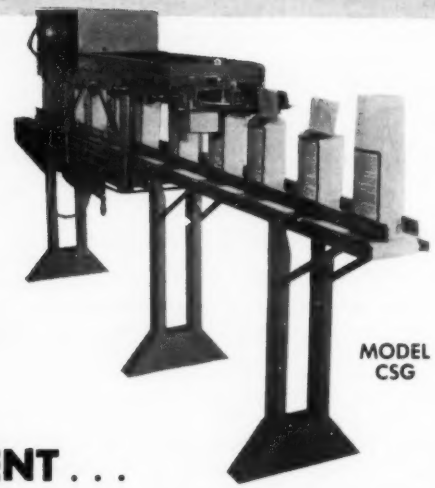
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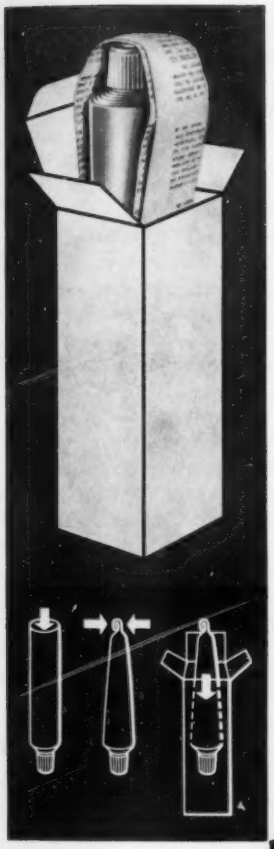
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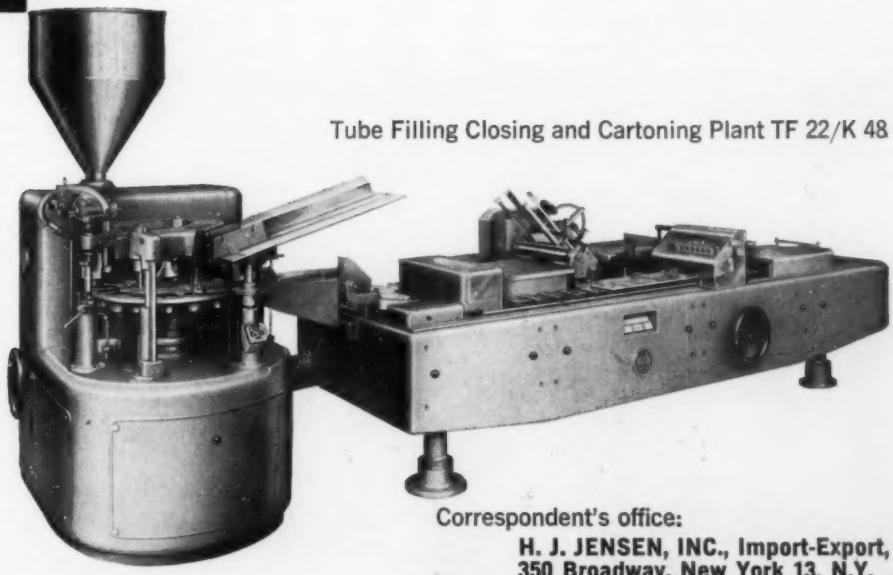
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LABELING EQUIPMENT

by R. W. Vergobbi*

More exact specifications from more purchasing agents point up the need for manufacturers to develop labeling equipment for a specific rather than general, all-purpose design.

There is demand for makers of labeling equipment to produce mechanisms especially tailored to each user's particular field. For example, in labeling glass-packaged foods, there are now available high-speed labeling units specifically designed for the job. This generally involves the application of relatively simple body labels to cylindrical glassware. Speeds of 300 or more per min. are commonplace. In the antibiotic fields, specific-purpose machines are offered for the labeling of a relatively small range of simple, straight-sided, squat, round vials. With scope, range or performance limited to a large degree, highly perfected labeling machinery has evolved.

In other labeling fields where a great deal of *dress up* is desired, as in liquor and cosmetic packaging, specialized labeling machinery has been designed to meet these more exacting requirements. Note that although the two widely divergent fields of liquor and cosmetic packaging have a common need for extreme *dress up*, the range of container sizes (relatively small) in a cosmetic line dictates the construction of substantially smaller or more compact equipment.

No longer can the manufacturer of labeling equipment expect to compete in his industry without a diversity of labeling units designed for specific rather than for general use.

This trend toward specific or specialized design of labeling equipment will reflect directly in increased costs of such equipment—it is not so quickly available as was the general-purpose labeling machine. It is also apparent that such limited-scope machinery is capable of better performance, higher speeds and increased productivity.

Five factors usually affect the selection of labeling equipment: (1) type of labeling work to be done; (2) production rate; (3) range; (4) flexibility and (5) cost of equipment.

Can labelers. In basic labeling machine types, the simplest design, capable of the highest operating speeds, is the familiar round-can labeler. Although produced by a relatively large number of manufacturers, the different models are practically identical. Round containers, horizontally fed, are rolled through the intake of the labeling machine; then moving belts, continuing the roller action, pass the container over glue applicators where spots of adhesive are picked up. The adhesive-spotted containers then pass over a horizontally positioned label stack. Timing, or positioning, of the container in relation to the uppermost label in the stack is such that the *glued spots* contact the *leading edge* of the label, pulling it up and wrapping it around the container. During the time interval or space between successive containers passing over the horizontal label stack, an adhesive-bearing belt runs crosswise to the direction of travel of the container depositing adhesive on the overlap end of the label. After the label has been rolled around the container, the overlap seals on the other label extremity. Finally, the labeled can passes over a soft rubber pad which tightly seals the label overlap.

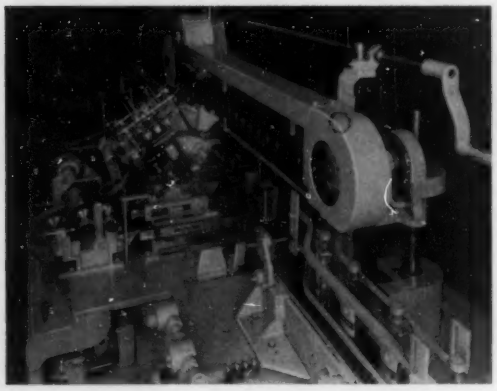
A *glue-tight wrapper* is applied by another type of labeling machine which receives a rectangular label either from the top of a label stack or from a continuously feeding roll. The label is then passed over a gluing drum where adhesive is picked up over the entire unprinted face of the label. Gripper chains transfer the glued label into alignment with a rectangular, filled and completely sealed carton. The carton proceeds through several stations of an intermittently traveling spider and is completely overwrapped or labeled. Although this type of basic labeler is not as widely known as the round can labeler, its use is indicated for additional protection—for example, against moisture or weevil infestation.

In the labeling field, the widest diversity of machine type and application exists in the labeling of bottles, jars, vials and similar containers or packages. The range of machine classification runs from simple table model hand-operated *gummers* to extremely complicated as well as high-speed, fully automatic units capable of bringing together in an assembly operation the container and various combinations of individual labels up to as many as four labels to a container.

Semi-automatic labelers. This type of machine usually involves manual feed of containers to the labeler and removal by hand after labeling. The process of selecting the individual label, applying adhesive and adhering it to the container is, of course, fully automatic. Labelers of this type are available for normal glue application work as well as for the handling of heat-sensitive or pressure-sensitive coated labels. Semi-automatic units are capable of extreme flexibility, require minimum change-over time and have general application where production requirements are not high.

Fully automatic labelers. Specifi-

*Chief Engineer, Pneumatic Scale Corp., Ltd., Quincy, Mass.



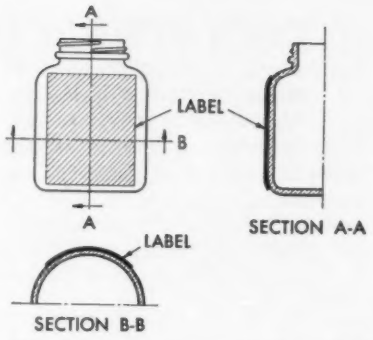
CLOSE-UP view of modern labeler with three-station indexing turret and suction pads that pick label from stack. As turret revolves, label contacts glue roller. Label is then transferred directly to bottle. (*Pneumatic Scale photo*)

cally intended for a production rate of 50 to 80 units per minute, they may include intermittently operating straight-line as well as rotary turret-type units. They are capable of *spot front* as well as *spot front and back* simultaneous application of as many as four labels. Other models are capable of all-around application of labels to round as well as oval or rectangular sections, tapered as well as straight-sided. Some models of all-around, fully automatic labelers offer 100% adhesion to container as well as full bond for paper-to-paper overlap. Although flexibility of all-around, medium-speed, fully automatic labelers is somewhat restricted, this is not true of spot application units where a range of from one ounce to a quart or from one pint to a gallon represents practical limits.

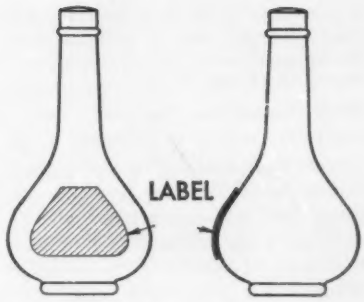
Stepping into high-speed labeling machinery application, a rather broad range exists since high-speed may cover almost anything from 100 to 300 or more labels per minute. Machines for thermoplastic as well as glue application are available. Intermittent as well as constant-motion, straight-line machines are built for general glass-container handling including shapes other than straight-sided rounds or purely cylindrical sections. Rotary continuous-motion labelers limited to the handling of straight-sided rounds are also available. On all three high-speed machine types, a great deal of flexibility is obtained; however, the most effective use of automatic labelers as well as any other type of high-speed packaging machinery requires good judgment. A high-speed operation is limited to the very minimum of sizes and the reasons should be apparent.

A typical high-speed glass packaging line invariably will include an automatic unscrambler or de-casing unit; automatic liquid, powder or tablet filler and screw capping machine; followed by the automatic labeler. In many cases automation continues in the form of cartoning, bundling and case packing or sealing equipment. In some plants the labeling operation precedes filling. Here, however, care is required in the balance of the line to prevent possible marring or tearing of a label that is not quite dry.

There are any number of special labeling machines. One type transfers a complete multicolor design from paper backing to plastic container. Another applies a Government tax *strip stamp* to the top of a liquor bottle;

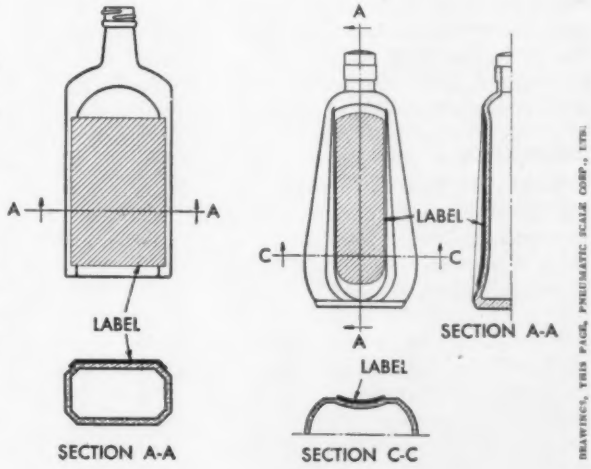


CURVING label on shoulder and base of round or oval bottles causes difficulties; operation is slowed and label may wrinkle.



FLAT LABEL will wrinkle if curved two ways. Do not attempt application to a convex spherical surface as illustrated here.

GUARD against having edges of label too near sharp corners or curves—edges tend to lift and more time is needed to inspect label. Drawings at right illustrate difficulty imposed by a concave surface, which curves two ways. Label application should not be attempted.





HIGH-SPEED labeler (right) and strip-stamp machine are shown here on line for 7-Crown Whiskey, in a distillery said to have highest production in the country for a single brand. (*Economic Machinery Co. labeler, Wright Machinery Co. strip-stamp machine*)

another applies labels automatically to shoe-box ends. Several manufacturers produce automatic labeling machinery that takes bottles coming at random along a conveyor line and presents them all one way in reference to design work or lettering for the application of the labels. These are generally designated as *spotter-type* labelers. One company attempts to combine unrelated operations such as liquid filling and labeling on a single piece of equipment. Some labeling equipment will feed labels in the form of a continuous roll. Another manufacturer supplies automatic dating or coding devices for his labelers capable of locating code data, either under the label or on the printed face side.

Some basic principles associated with proper and efficient labeling machine performance bear repetition. These involve basic container and label design, label stock specifications and hints on proper uses of adhesives.

Label stock

Label stock gives best results when not too heavy or springy. If applied to a perfectly flat surface, weight of stock is not such a factor, but, if the container surface is curved, a good plan is to use a 45- to 50-lb. stock, not too highly calendered. Heavier stock will tend to lift at the ends and more time must be allowed to secure the label. As a result, machine speed is lowered. For the same reason it is essential that the grain of the paper run horizontally or around the container. Label stock, when moistened, will curl so that the edges which are wiped around curved surfaces will lift up unless the grain of the stock runs around the curved surfaces. The grain should not run up and down.

A flat sheet of material used for a label can be curved in only one direction without wrinkling. Therefore do not attempt to apply a label to a spherical, concave or convex surface. It can curve in one direction but not in two at once. A good plan is to allow for slight inaccuracies in machine registration. Figure on a reasonable margin around edges of label; then if it is a little off center the error will not be too noticeable.

Adhesives

There are countless types of glues, pastes and gums in common use today for general sealing, wrapping and labeling work. The task of specifying the correct type for your work must be handled by an adhesive expert. He can do this only after you give him complete data on your requirements—what kind of label stock; whether container is tin or glass or some other type; size and shape of both container and label; the method you will use to apply the label, and the speed of the labeling operation.

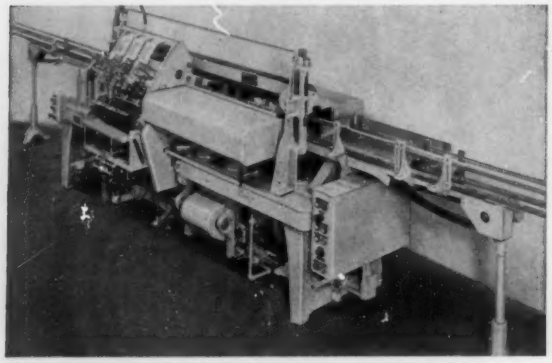
Climatic conditions seriously affect adhesives. Glue, paste or gum should be stored where it will remain cool during warm months, but will not be subjected to freezing temperatures during winter. In localities where the air is unusually dry, a good plan is to cover the glue keg with a heavy, soaking-wet cloth. Any good adhesive with quick-drying qualities must contain the necessary chemicals to cause some evaporation.

A light film of adhesive tends to prevent crystallization and, except in very rare cases, will assure a tighter seal than will a thick film. This holds true in sealing carton flaps, in tight wrapping or bottle labeling.

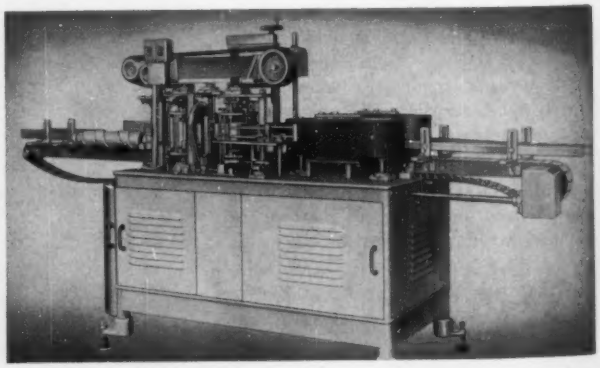
One difficulty which can be avoided by careful planning is the trouble caused by wet or greasy containers. Unless the container surface is clean and dry the labels are quite sure to wrinkle and blister after the moisture evaporates, and some may fall off. A greasy container surface caused by splashing or overflowing during filling of an oily product will probably prevent applying the label with any degree of satisfaction. Therefore every operation in your entire packaging line must be watched to make sure something is not being done incorrectly which might cause trouble later.

In machine labeling, it is a good plan to keep the glue reasonably heavy in the glue pots but to use a thin film on the bottle or jar or label. The adhesive should be tacky enough to produce a noticeable hissing sound when the glue rolls are revolving. Glue should not be so heavy that excess webbing or stringing occurs when the glue pad comes away from the bottle or jar. Thin the glue out three or four times daily by adding a thinner mixture of the same adhesive. *Don't* add water to thin out the mixture in machine glue pots. *Don't* mix different kinds of adhesives; one may neutralize the efficiency of another.

For successful machine labeling (using cold adhesives) never bring two hard finishes together; at least one surface should be reasonably soft and porous to allow adhesive to penetrate and actually bond the two articles together. Don't hinder or slow up the gluing by expecting the adhesive to penetrate through a finish which is inked, waxed or varnished. Wrappers or labels for curved surfaces should not be too heavy. A 45- to 50-lb. stock usually gives best results.



CONTINUOUS-MOTION, high-speed labeler applies labels to front, back and neck of bottles at speeds ranging up to 300 a minute. (*Economic Machinery Co. photo*)



VERSATILE LABELER for round, rectangular or oval containers in a range of sizes. Machine can apply panel or wrap-around labels to plastic, glass, paper, etc. (*MRM Co. photo*)

CARTONING EQUIPMENT

by William F. Dent*

Cartoning, or carton loading, is the loading of a solid or semisolid article or number of articles into an end-opening carton. Carton filling, (see "Filling Dry Products," Section 12) refers to filling free-flowing products into cartons by measuring the amount of product volumetrically or by weight.

There are two basic types of cartoning machines: semi-automatic and fully automatic. In each case, the machine will feed a carton from a magazine and form it. If an operator is required to place the article into the carton, the machine is classed as a semi-automatic. It is classed as a fully automatic when the article is inserted into the carton by the machine, even though an operator may have been required to place the article in a pocket of the conveyor.

The types of cartons handled on cartoning machinery can be divided into two general classifications: tuck-end or glue-end. Tuck-end cartons can be further broken down into reverse-tuck or straight-tuck. The reverse-tuck carton has its end panels extending off the top and bottom main panels while the straight, or airplane tuck, carton has its end panels extending off the same main panel. Glue-end cartons include full flaps, economy flaps and butt flaps. A full-flap carton has a complete overlap of the end panels. With economy flaps the overlap is reduced, which results in the use of less carton board. Butt flaps, of course, use the least possible board but, because of slight variation in cartons, a gap may result between the meeting flaps. Unless the side flaps meet or overlap, this slight gap could be objectionable.

Some plants have sufficient capacity of a single-size item to warrant a fully automatic cartoning machine for the item, but the majority of the cartoners built today are adjustable machines. The modern cartoning machine is designed and built to give many years of service so it is wise to buy a cartoner with somewhat more adjustability than your production calls for today. Then, if the size of your package must be changed, your cartoner will be able to handle it—provided, of course, that sufficient adjustability was incorporated.

Almost all modern cartoners are equipped with variable speed drives so that the speed of the cartoner can be adjusted to suit your production line. Generally a fully automatic cartoner operates somewhere between 60 and 200 packages per minute, although there are many high-speed cartoners in operation producing 250, 300 or 350 packages per minute.

Semi-automatic cartoners

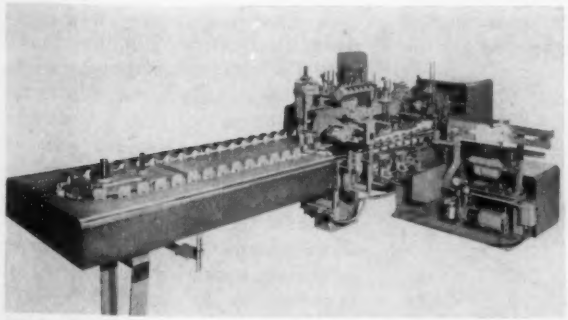
As mentioned before, a semi-automatic cartoner is one in which an operator will place the article into the carton manually. The machine feeds the carton from its magazine, forms it, closes the bottom of the carton by tucking and then carries the carton through a manual-loading area. While being carried through the loading area, the carton may be vertical, horizontal or, on occasion, inclined at an angle (depending on the machine used). After the carton leaves the loading area it is then closed by tucking the top end panel and discharged from the machine. Other semi-automatic types feed the cartons from a magazine, form them, close the bottoms by tucking, and then discharge set-up cartons on a delivery belt.

Any number of operators can be along this belt to insert the load into the carton. The carton then is closed manually or can enter a separate machine which closes it automatically.

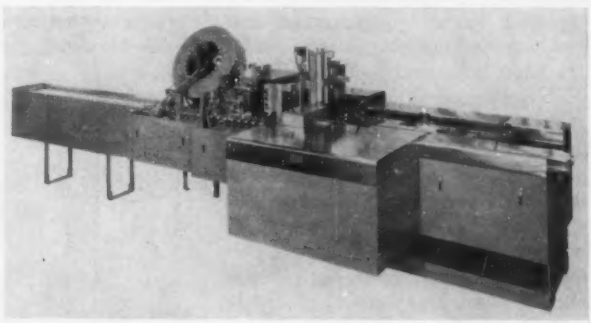
There are three distinct advantages to the semi-automatic machine: range



SEMI-automatic machine forms the carton, closes the bottom, discharges set-up carton onto delivery belt. (*Bivans Corp. photo*)



BASIC TYPE semi-automatic cartoner is made in 2 standard and 4 or more special models. Quickly adjustable to wide carton-size range. Range: length, ¾-3¼ in.; width, ½-3¼ in.; depth, 2½-8 inch. Speed, 40-120 a min. (*R. A. Jones photo*)



FULLY automatic high-speed cartoner is equipped with rotating hopper to feed an applicator tube into the pocket of each article conveyor. Machine is equipped with sheet fed circular mechanism. (*Redington Div., Crompton & Knowles, photo*)

*Regional Sales Manager, Crompton & Knowles Packaging Corp., Redington Div., Bellwood, Ill.

of adjustability, relatively low cost, and the ease in manually inserting a complex load into the carton. For many types of multiple loads, a semi-automatic cartoner is really the only practical way of producing the package. Semi-automatic machines almost always have a greater degree of adjustability than fully automatic machines. In most cases, the semi-automatic can be changed over from one size to another more quickly than a fully automatic. Because it is less involved than the fully automatic, the cost of the equipment is usually less.

Fully automatic cartoners

Basically a fully automatic cartoning machine consists of three parallel conveyors synchronized together—one to carry the article, one to carry the carton and one to transfer the article into the carton. The carton is carried through the machine horizontally with the open end at right angles to the direction of travel. (See Figure 1.) In addition to the conveyors, there are two principal mechanisms—one to feed and form the carton, the other to close it by tucking or gluing or both.

The simplest type of fully automatic cartoning machine is equipped with a pocket intake conveyor into which the operators will manually place the articles to be cartoned. As mentioned, since the article is inserted into the carton automatically, the machine is considered fully automatic.

When bottles are to be handled, the pocket intake cartoner is equipped with an infeed conveyor and some means of automatically transferring the bottles into the pockets of the conveyor. The bottles usually are discharged from the labeling machine standing upright. They are brought into the cartoner on an infeed conveyor, timed by a star wheel, transferred into the moving pocket of the conveyor by a transfer wheel and gently guided down so that the bottles are lying horizontally in the moving pocket. For certain articles, namely of cylindrical or spherical shape, a chute intake is well suited. The articles are placed in a chute by the operator and the machine automatically transfers an article from the chute into each bucket. Sometimes the bucket can be used to strip the item from the chute but often an escapement is needed.

For many years the bottle intake cartoning machine was the most advanced type of automatic cartoner available. Today, to save labor, more

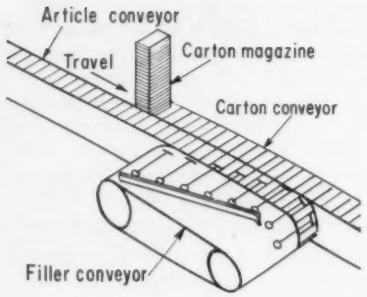


FIGURE 1
Fully automated cartoner

and more cartoning machines are equipped with automatic means for transferring the articles into the article-conveyor pockets. An example: a cartoner handling cracker packets where two or more wrapping machines feed the intake of the cartoner. The machine must accumulate the wrapped packets, orient them properly and insert them into the carton.

Attachments

The modern cartoner can be equipped with many different attachments for feeding such items as leaflets, corrugated protectors, droppers, platforms, and mechanisms to print or impress information on the carton.

Because circulars or leaflets are required by law for many ethical pharmaceuticals and also are desired for other purposes by many manufacturers, a leaflet-feeding and -folding mechanism is probably the most important attachment to a cartoning machine. There are two common ways of handling the leaflet: either by feeding die-cut sheets from a magazine or by cutting the leaflet from a roll using photoelectric registration. Whether the leaflet is fed from a magazine or cut from a roll, it must be folded and placed in the pocket of the conveyor with the item to be cartoned. As the article is inserted into the carton, the folded leaflet is carried in with it.

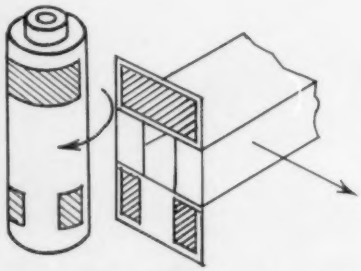


FIGURE 2
"Double glue" circulating glue system

Probably the second most important attachment on a cartoning machine is a printing unit. The unit is used for printing expiration dates or lot numbers on cartons, description of the article, price data and the like. The mechanism avoids the necessity of a separate printing unit. By printing this data with a cartoning machine attachment, only the actual number of cartons needed for the run is printed. The strict control required in pharmaceutical plants makes cartoner printing attachments most necessary. In other types of industries where many different items are placed in the same carton, such as the packaging of automotive parts, printing the descriptive name of the part on the cartoning machine greatly reduces the inventory of cartons.

Often, a mechanism is used that impresses a code or other information in the carton board. Sometimes the steel type is heated to brand the carton.

If it is necessary to provide some protection around a bottle, the machine can be equipped with a mechanism to feed a die-cut corrugated sheet from a magazine and wrap it around the bottle before the bottle is inserted into the carton. Sometimes cartons with inner-panel construction are used to protect the article and eliminate the need for the corrugated.

Many cartoning machines handling collapsible tubes are constructed to drive the tube-filling machines and automatically transfer the filled and closed tubes from the filler directly into the moving intake pockets of the cartoner. Because of the close timing necessary it is customary to have the cartoner and tube fillers connected with a common drive.

When the item to be cartoned bulks higher than the carton (as in the case of facial tissues, napkins or long-cut macaroni), the cartoner is equipped with a mechanism to press the item down gently during the filling operation. The presser is carried by a conveyor, for it must be timed with the article, carton, and filler conveyors.

Some cartoners handling tuck-end cartons are equipped with a strip-gluing mechanism to apply a narrow band of glue to the inside of the end panel of the carton. This is done to make the carton somewhat tamperproof or to help carry the weight of a heavy item. The glue will cause the end panel to adhere to the side flaps. Sometimes the glue is applied to the tuck flap so that the flap adheres to

the front panel of the carton. Spots of glue are sometimes applied so that the carton can be opened readily. When handling glue-end cartons, the machine can merely glue the outer end panels together (single glue) or it can glue the inner end panel to the side flaps, in addition to gluing the outer end panel to the inner (double glue). To accomplish the latter, it is necessary to have vertical glue rolls over which the glue is pumped by a circulating glue system. The glue is applied in a definite pattern resulting from the use of milled spots in the glue roll in the intaglio process. (See Figure 2.)

The most common adhesives used are either dextrin or resin although the use of hot melts is becoming more and more prevalent because of the rapid drying of the adhesive. This is especially important with high-speed operation because it is possible to reduce the length of the drier conveyor.

The efficiency of cartoning machine operations can be improved by detecting mechanisms. These include:

Skip-carton. If an article is missing from the pocket of the intake conveyor, the machine will skip or not feed a carton for that pocket. The machine continues to run.

No carton. In the event a carton fails to feed for a properly filled pocket of the article conveyor, a "no carton detector" will stop the machine.

Empty carton detector. Sometimes a mechanism will be provided to stop the machine in the event an empty carton is produced. More often an air jet is directed against the discharge line of the cartoning machine to blow off an empty carton.

Skip-fill. Sometimes a skip-fill mechanism is used in conjunction with a no-carton detector. Rather than stop the machine if a carton fails to feed for a properly filled article bucket, the skip-fill mechanism prevents the filler from transferring the article from the article conveyor into the carton conveyor. The article, retained in the article pocket, drops out of the pocket as it goes around the sprocket.

Overload releases. Quite often a mechanism is provided in the filling area to stop the machine if excessive pressure is exerted due to a jam.

Multipackers

This machine, sometimes referred to as an overpack cartoner or package packer is, by definition, a packaging machine handling a multiple load. Because of the relatively slow speed of the multipacker and the need to accumulate the multiple load in the proper orientation, it is customary to operate it with intermittent-motion conveyors rather than continuous motion.

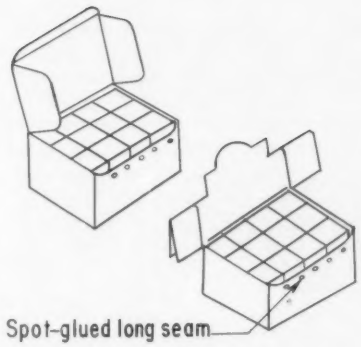


FIGURE 3
Trunk multipack and display cut-out

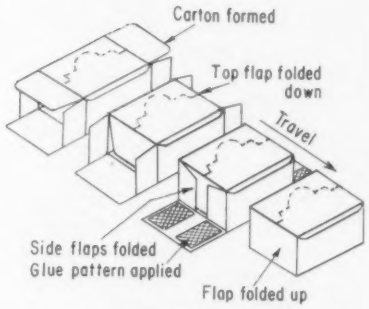


FIGURE 4
Folding sequence of carton above

It is generally conceded that the most efficient multipacker will take the output of one cartoner. The efficiency of the multipacker, of course, depends not only upon its own efficiency but also upon the efficiency of the machine feeding it. If the multipacker itself is not efficient the line efficiency will decrease; this becomes more serious if more than one machine is feeding the multipacker. In this event it is customary to converge the output of the two machines into a single line in such a way that if one of the unit cartoners goes down for any reason the multipacker can continue to operate.

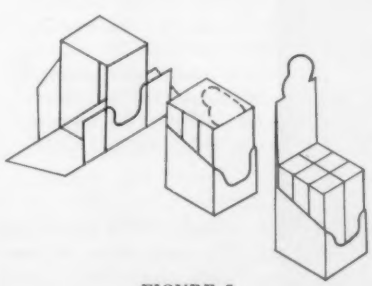


FIGURE 5
Multipack display carton

One of the most popular styles of multipack cartons is illustrated in Figure 3. The long seam of the carton is spot glued by the carton manufacturer so that, after the carton is received by the consumer, he merely slits the long seam and obtains a trunk style or top-opening carton. The folding sequence is illustrated in Figure 4. Note that glue does not contact the inner-end panel attached to the top panel. With die cut-outs in the top panel an attractive display carton can be obtained. The same type of carton can have the long seam glued on the outside of the carton with the flap protruding for easy opening. The score line of the top panel can be perforated so that it can be torn off easily by the retailer. This type of carton is extremely well suited for machine handling since it has all the advantages of an end-opening carton. The consumer, on the other hand, has the advantages of a top-opening style.

Another typical example of a multipack display carton suitable for machine handling is illustrated in Figure 5. Note the attractive display features for the retailer. Trays and sleeves also are frequently used as multipackages.

Carton specifications

The majority of the cartons handled on the modern cartoning machine are tuck style, usually reverse tuck, since a reverse-tuck carton takes less carton board and therefore is less expensive than a straight tuck. The machine efficiency depends considerably on the cartons it is to handle. Each cartoning machine manufacturer has his own standards but these are strikingly similar. The user of the machine should follow manufacturer recommendations when ordering cartons. The carton supplier will pack the flat cartons in the shipping containers properly but care must be taken by the user in storing them until they are used. The cases should not be stacked too high because it could mean excessive load on the lower cases. The temperature and humidity of the storeroom are important, for cartons exposed to excessive heat during storage tend to dry out and this causes uneven shrinkage. Excessive moisture also affects the cartons because rigidity of the carton board is decreased by moisture.

HEAT SEALING

by William E. Young*

The use of heat for sealing the contacting surfaces of packaging material has become of great importance in recent years. In the early days of packaging, glue was usually employed for sealing. Paper and paperboard were the only common flexible and semirigid packaging materials then in use; their absorptive properties rendered the glue tacky almost immediately, so that a modest application of pressure for a short time would produce primary sealing. Primary sealing is defined as that which is adequate to resist the springback tendency of the packaging materials. Further absorption and evaporation of the glue solvent, usually water, ultimately "sets" these primary seals into functional seals, which are defined as those of adequate strength to meet their intended function. Even metallic foils were usually combined with paper, enabling them also to benefit from its superb gluing properties.

The use of glue requires its even application in the area to be sealed and time for it to become tacky enough for primary sealing. This time may be taken either before the glued surfaces are brought into contact or after; if after, pressure must be maintained to hold the glued surfaces together until primary sealing occurs. Heat often is used in automatic gluing equipment to reduce this time factor to a minimum by promoting rapid evaporation of the glue solvent. Pregluing is also employed to reduce sealing time and is probably responsible for the earliest use of heat sealing in packaging. Glue is first applied to packaging material in the areas to be sealed later, and allowed to dry. The pre-glued material is then machine processed into packages; the application of heat to the material in the regions to be sealed softens the glue, conditioning it for a primary seal without requiring any drying time. Pre-gluing is essential if appreciable machine speed is to be achieved when sealing areas do not include absorptive packaging material.

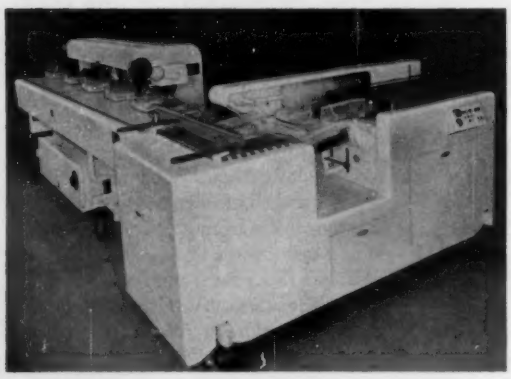
The advent of waxed papers and boards provided a natural field for heat sealing since wax and wax-based coatings have excellent sealing qualities. Although wax-type seals are quite weak, this weakness is useful for many packages as, for example, in the case of bread wrappers. The seals on the loaf ends may be neatly opened without tearing the wrapper, then refolded to protect the remainder of the loaf. Since the "glue" is everywhere on a waxed wrapper, wrapping machines using waxed paper require no glue application or drying devices and, therefore, often operate at greater speeds than glue-type equipment.

One of the first flexible packaging materials not involving paper was cellophane. Since cellophane is relatively nonabsorptive, it is offered with a heat-sealable coating, making it usable in high-speed wrapping machinery. An added advantage of a heat-seal coating over glue is that the sealed area is almost indistinguishable from the rest of the material. This is an important appearance feature with transparent wrappers.

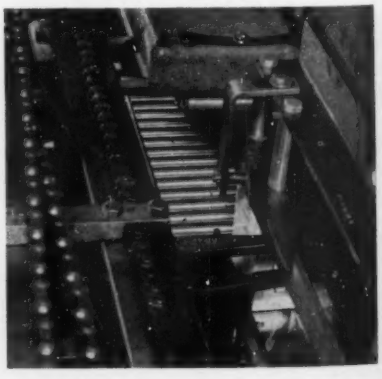
As the packaging art progressed and more convenience items, particularly in food, were developed, hermetically sealable flexible packages were required. Since the heat-seal coating on cellophane is applied from solution, it is necessarily thin, and only seals made under laboratory conditions might possibly be hermetically tight, even though production seals possess good mechanical properties. This problem was solved by laminating or "gluing" a thermoplastic, heat-sealable sheet to cellophane to act as a thick enough coating to produce reliable hermetic seals. Pliofilm and polyethylene both performed this function well when combined with cellophane. Polyethylene is now coated onto cellophane and other materials directly from the extruder.

The combining of various materials to make up a composite sheet has extended to barrier materials for protection of military items, often combining the tear resistance of cotton scrim, the strength of kraft paper, the moisture- and gas-barrier properties of aluminum foil and the sealant properties of vinyl chloride or polyethylene. A highly oriented material such as Mylar loses its strength at its welding temperature, so a coating of polyethylene, which seals at a temperature below that which weakens Mylar, makes the Mylar heat sealable. It is of paramount importance that the bond strength between polyethylene and materials such as cellophane and polyester film be of a high order because, if it is not, the mechanical and barrier properties of the cellophane or

*William E. Young & Co., Little Falls, N. J.



BEAD WELD seals are produced on this automatic combination loader-sealer. Unit in foreground feeds buns into polyethylene bags. Sealer, background, welds edge, trims excess material, code dates. (*Carbert photo*)



ROLLER-SEALER on vinyl-film packaging machine. Rolls supply heat; avoid drag on film. (*Goodyear Tire & Rubber photo*)

polyester will not be fully available to the package.

Thermoplastic films by themselves have properties which make them useful in packaging. When heat-sealing them, however, they tend to stick to and extrude from under a hot seal bar, thinning out the material at the seal and often tearing holes in it. In the combination type materials described previously, a nonsoftening material such as paper, cellophane, polyester or foil separates the thermoplastic film from the hot seal bar, eliminating sticking and excessive thinning out of the sealant film. Since there is no protective film when sealing thermoplastic films alone, special provisions must be made.

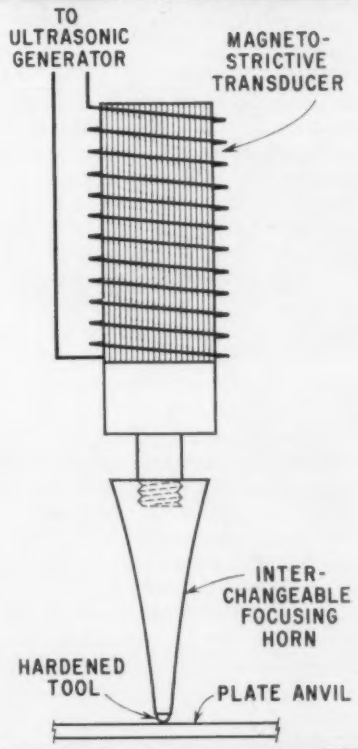
The high-speed production items packaged in flexible materials range from lightweight cigarettes through 6-oz. cheese and sausage items to 1-lb. frankfurters; their packaging films range from about 1 to 3 mils in total thickness. Garments, other soft-goods including heavier items such as sheets, green produce items running to 20 lbs. or more, and many other products ranging from dehydrated dog food to fertilizer, are packaged in polyethylene from 1½ to 4 mils thick. Inasmuch as materials in this thickness range may be quickly heated, their rapid machine sealing with hot bars or wires presents no problems. When materials 5 mils and over in thickness are sealed, more time is required to heat them up, so preheating often is used to lower the time the sheets are between the sealing members. Time, then, becomes of increasing importance as heavier gauge materials are to be sealed, since all of the heat required to raise the interface to welding temperature must pass through the thick sheet. Raising the temperature of the sealing members helps, of course, but too high a temperature will damage the portion of the material adjacent the hot members. Fortunately, electronic sealing utilizes cold sealing members, and heat for sealing is created inside the packaging material by its reaction to a high-frequency electric field. Many packaging materials exhibit this phenomenon, particularly the vinyls, making it possible to seal rapidly films 30 mils or more in thickness.

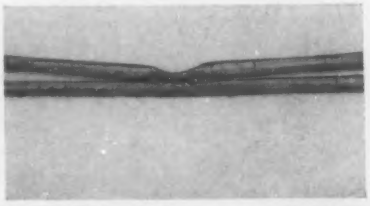
Unfortunately, the versatile and inexpensive polyethylenes and polypropylene do not have electrical properties which permit electronic sealing; they do, however, have outstanding high-temperature properties which allow them to be sealed by holding a red-hot, electrically heated rod or taut wire just outside protruding edges of the clamped sheets. The sheets melt back to the clamps, drawing into a bead; immediate application of pressure to the bead assures a good weld, but, for applications where occasional pinholes are not objectionable, mere formation of the bead is sufficient. In some polyolefin bag making machines, the hot wire is used both to cut the bag from the parent sheet and simultaneously weld the cut interfaces together. Controlled open flames have also found a place as an alternate to the hot rod or wire in certain polyolefin sealing applications.

Impulse sealing, although relatively slow, produces excellent seals and is particularly valuable for sealing unsupported thermoplastic materials. The materials are clamped together between resilient jaws, one or both of which have a narrow metal ribbon running their full length down the center and covered with Teflon- or silicone-rubber-coated glass cloth. A controlled electric current then flows through the ribbons for a pre-set period of time, liquefying the material between the ribbons and obliterating the interface. The jaws remain closed until the material solidifies into a primary seal. Where repeated sealing is to be done, such as in a production machine, the jaws are air or water cooled to maintain them at a low enough temperature to withdraw heat quickly from the material after it has been melted. Since the jaws are held apart by unmelted material on both sides of the ribbon, no appreciable thinning of the material occurs at the seal. Impulse sealing, unfortunately, suffers from the same limitations as hot-bar sealing, since all of the heat required to liquefy the interface must pass through the packaging material.

One of the first departures from reciprocating heated jaws was the introduction of hot rotating wheels for sealing the tops of filled bags. Although this method severely limits dwell-time between the wheels, preheating of the bag mouth makes this method practicable. Rotary sealing, being continuous, is more readily integrated with conveyorized bagging operations than reciprocating jaw sealing. Where greater sealing speed is required than is possible with rotating heated wheels, endless moving thin metal belts or bands, heated







PROMISING new approach to sealing employs ultrasonic vibration. Here oil-packed bearings are sealed in 5-mil polyester. Unit utilizes a magneto-strictive transducer (detailed in drawing) with a compression-wave action. A tight seal is welded right through the lubricant. Complete weld is shown in the photomicrograph of the seal area, which is immediately below the drawing. (*Ultra Sonic photo*)

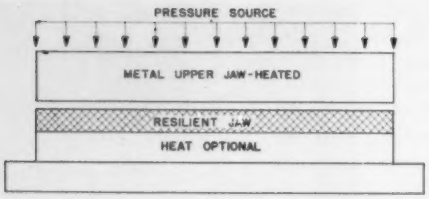


FIGURE 1: Jaw-type bar sealer. Heat thermostat controlled; pressure, manual or mechanical; dwell-time, manual or automatic. Used for coated or laminated materials. Resilient lower jaw permits sealing over wrinkles, splices, etc.; may be replaced with metal bar.

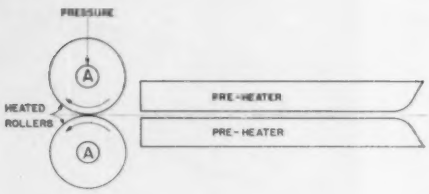


FIGURE 2: Rotary-type bar sealer with optional preheaters. Material is carried through preheaters, then between rollers, manually or on belts. One roller may be resilient; one or both may be serrated to produce crimped seals in finished package.

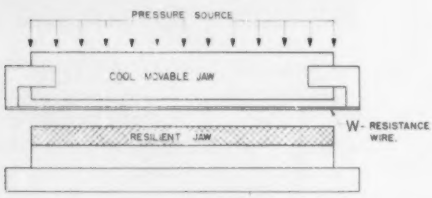


FIGURE 3: Impulse-type sealer. Jaws are cold; heat is supplied by resistance wire that gets a quick shot or impulse of current. After impulse, material cools while still under pressure. Cooling period is timed to prevent film distortion.

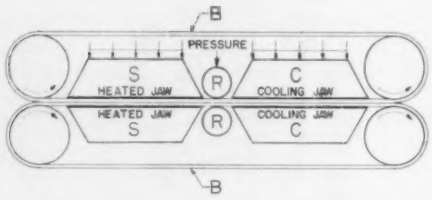


FIGURE 4: Band rotary sealer. Endless metal bands (B) carry material between heated jaws, pressure rollers (R) and cooling jaws. Thin bands transmit heat rapidly, hold material in contact while heating to form seal and cooling to "set" seal. For thin materials the rollers (R) generally are omitted and the jaws brought almost together in their place.

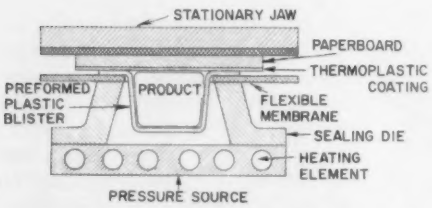


FIGURE 5: Shaped bar heater seals edge of preformed plastic blister or bubble to coated paperboard. Sealing is accomplished through a nonstick membrane that transmits heat into the flange of the preformed package.

Figs. 1-4 courtesy Supply Engineering Div., U. S. Naval Supply Research and Dev. Facility; Fig. 5 courtesy Packaging Industries Ltd., Inc.

by stationary heated shoes, are used. The package mouth is directed to pass between a pair of these bands; if greater speed is required, the bands and their heated shoes need only be lengthened to maintain the required sealing time when the bands are run at higher speeds. Water-cooled band shoes may be provided after the heated shoes to cool the freshly made seal before releasing it from the clamping force of the bands.

This type of sealer is particularly effective for the continuous sealing of unsupported films. The heated shoes are so shaped that they touch the band only near its center, leaving the band edges cool; these cool edges support the unsoftened portions of the films while the heated band center welds them together. The weld cools when the bands pass over the cooling shoes, producing an excellent seal at a high rate of speed.

To assure tight seals between sheets made of composite materials, the inner sealant film must be thick enough to provide material to flow into any wrinkles in the seal, and to compensate for normal uneveness of the surfaces of the sealing members and caliper variations in the packaging materials. Good production supervision and equipment maintenance will minimize leaks caused by seal bar damage and contamination. Normal control of packaging material quality will assure uniform caliper, so that no leaks should be attributable to this cause. The leaks most difficult to control are those caused by wrinkles, particularly in the final or top seals which close face-to-face sealed pouches after filling. It is impossible to assure precisely equal lengths for both pouch faces between the side seals; even if the pouches are well made, filling may stretch one face slightly longer than the other. When the two faces are pressed together for sealing, excess material in the longer face may form a bump or wrinkle. Although a thicker sealant film may fill such wrinkles and prevent leaks, thicker films cost more and take longer to seal. For this reason, vacuum and gas packaging machines for sealing filled pouches generally include devices for laterally stretching the pouch mouth to equalize the width of the pouch faces before sealing. This permits the use of sealant films of minimum thickness.

Silicone elastomers have provided the best materials for resilient backing members, or sealpads, for heat sealing, since they are stable over the usual ranges of heat-sealing temperatures. Teflon coatings are widely used on heated sealing members since they provide a durable release coating to discourage build-up of contaminants. Where maintenance of the Teflon coating is a problem, alternative use of the coated glass cloth discussed in connection with impulse sealing may help; the cloth also may be used to protect the silicone rubber sealing pads from contamination. Teflon coating on the bar, however, still gives a lower resistance heat path than the cloth, and so would be the sole choice in some critical applications.

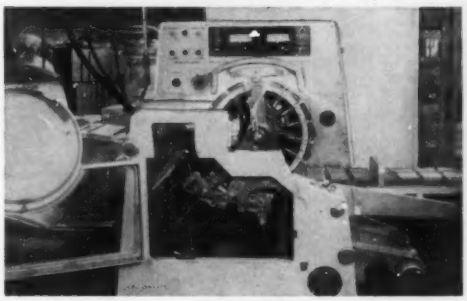
In addition to the making and sealing of packages, heat is also used for adhering labels backed with a heat-softening coating to packages or other objects. An even newer approach to imprinting on the packaging line is a reverse-printed tape which will offset or release the printed matter from the tape to the packaging film when heat and pressure are properly applied, in a fashion similar to a water-activated decalcomania. Sometimes, this tape is completely coated with an offset "ink" and the printed matter transferred by pressing the tape to the film with heated "type." This method is used to apply small trademarks to otherwise unprinted film to identify its origin.

Skin packages generally are made

by using atmospheric pressure for the sealing force and using the forming heat already contained in the film to provide a tacky sealing surface. The paperboard portion of the package is usually coated with a heat-responsive material which seals it to the hot film shell when the film is drawn over the objects and into contact with the board. When the inner surface of the blister film is made of polyethylene, the polyethylene will seal to most paperboard surfaces without their being specially coated.

Sealing a thin plane top onto semi-rigid thermoformed trays presents no problems when the sealing heat is supplied through the top film. If heat is to be supplied through the thicker bottom, or heat must come through a heavy paperboard top, the sealing time necessarily will be long. In order to produce such packages at good speeds, it is necessary to produce them in multiples, rather than singly, making for higher tooling cost. Finding faster means for sealing such packages, particularly when made from high specific heat polyethylenes and polypropylene, is a major challenge.

All methods of sealing by heat are alike in that the interfaces to be sealed must be simultaneously in intimate contact and at the proper sealing temperature. Where both interfaces are made of the same material, the proper sealing temperature is the welding temperature, or the temperature at which the interface disappears. Pressure is used to assure intimate contact of the interfaces, and time is employed to bring the interfaces to sealing temperature. These three variables all have upper limits—temperature is limited by damage to the material, pressure by thinning out of the seals, and time because of production objectives. They also have lower limits, set mostly by physical properties of the materials to be sealed. Considerable latitude exists within these upper and lower limits, making it possible to do many difficult sealing jobs commercially. Treatment of this subject actually is a study in itself for each particular type of material; polyethylene's sealing properties already have been covered.[1]



SHAPED HEATER BARS are used in vacuum- or gas-packaging machine that heat seals more than 60 packages per minute. Product to be packaged enters machine from right and is sandwiched between two films. (*Standard Packaging Corp. photo*)



NON-BRITTLE heat seals in polystyrene sheet are possible with special die design and with precise process controls. (*Tronomatic photo*)

Sealing methods and equipment may be roughly classified into bar, impulse, band, electronic, ultrasonic, radiant and hot melt, features of which are summarized below.

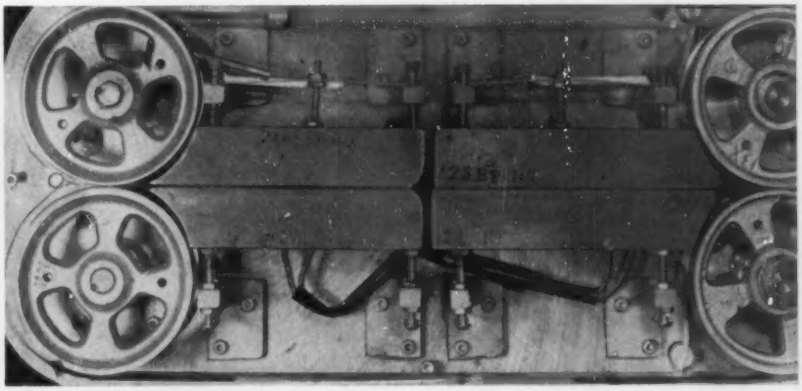
Bar. Sealing with a hot bar or iron, wielded by hand or mounted in a machine, is the oldest and still most widely used method. Simple hand or foot operated electrically heated reciprocating bar or jaw-type units are the cheapest sealers available. Air or electrically activated, automatically controlled units are also available. Figure 1 (see p. 460) illustrates the basic operation of the jaw type of bar sealer. Bag-making and packaging machines often utilize bars shaped to produce seals shaped into L's, U's and more complicated shapes, as in Figure 5, in order to produce more than one package edge at a time; they are also used to produce multiple packages. Figure 2 illustrates the rotary type of heated bar sealer, through which material may be fed continuously.

Mating serrated jaws, both made of metal and electrically heated, are widely used for sealing cellophane packages; the serrations tend to stretch out wrinkles and give a neat, uniform appearance to the seals. When laminated materials are used to obtain better seals, serrated jaws tend to damage the material, but smooth jaws give good seals when they meet uniformly throughout their length. Since it is impractical to maintain adequate straightness to mate properly heated bars, the heat obtainable from one of the bars is sacrificed and a resilient surface substituted, as shown in Figure 1; this as-

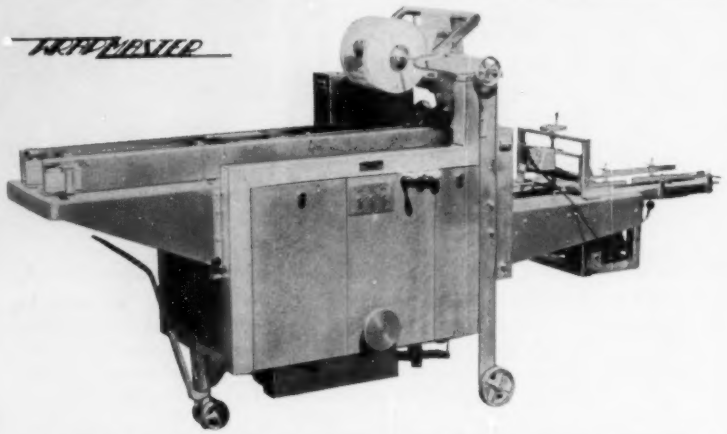
1 See "Polyethylene Heat-Seal Factors," MODERN PACKAGING, April, 1958, p. 152 et seq.



BAND SEALER and belt conveyor for handling polyethylene bags. (*Doughboy*)



CLOSE-UP of sealing jaws of rotary-type heat sealer which is capable of operating at a seal-production speed of 316 linear inches per minute. (*Ralph Chaffee & Co. photo*)



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sures good contact throughout the seal length. Further improvement in seal quality may be achieved by putting a round contour on this resilient surface, accomplishing two major objectives. When the flat, hot and curved, resilient surfaces first meet to seal the mouth of a pouch, sealing begins along a narrow line. As pressure builds up, this "line" widens, pushing ahead and away from the seal any trapped air or droplets of moisture between the pouch faces. (Air or moisture trapped in a seal area expands with the applied heat and causes tiny ruptures in the seal after the jaws are removed.) The other and equally important benefit from curving the resilient surface is that of a pressure gradient during sealing, where a very high pressure exists at the center of the seal, tapering to zero pressure at the seal edges. This assures that there will always be two lines of optimum sealing pressure along any heat seal made in this fashion, assuming of course that the sealing unit is correctly designed.

Impulse. Although usually more expensive and slower than the jaw-type bar sealer, it is superior in most instances for sealing unsupported thermoplastic films. Shaped sealing ribbons are also in use for shaped seals as mentioned under bar sealers, but are far more difficult to control since they require tensioning devices to hold them flat when they expand each time they are heated. The big advantage of the impulse sealer is that the seal may be cooled before pressure is removed, as in Figure 3 on p. 460.

Band. Figure 4 illustrates this sealer which is, in effect, a continuous impulse sealer. First, heat and pressure are supplied through the thin bands and then heat is removed through the bands while the seal is held under pressure. Although generally more expensive than the impulse sealer, the ability of the band sealer to integrate with a continuous operation and also handle unsupported thermoplastics assures its important place in packaging operations.

Electronic. High-frequency sealing equipment is the most expensive method (except ultrasonic) but certainly most economical for sealing many heavier materials. Fabricated "packages" such as wallets, instrument cases, purses and an endless list of similar items made from heavy vinyl chloride film are sealed by this method, utilizing shaped "bars" or electrodes which can perform both the sealing and cut-

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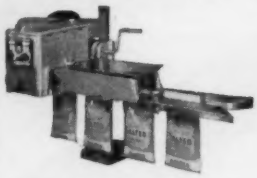
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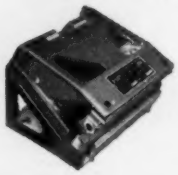
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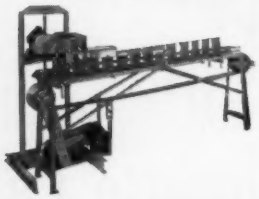
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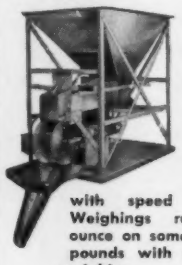
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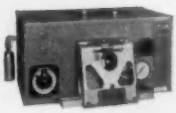
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ting function. Rotary electrodes, too, are used for continuous sealing, analogous to the rotary sealer pictured in Figure 2. One great advantage of electronic sealing is that the seal bars may be kept chilled while the high frequency energy they deliver heats the material to be sealed, allowing the bars to chill the seal after its completion. Perhaps the greatest advantage of this method lies in its ability to heat the interface to be sealed without regard to the thermal conductivity of the material, making it possible to seal even a poor heat conductor like vinyl-coated corrugated board.

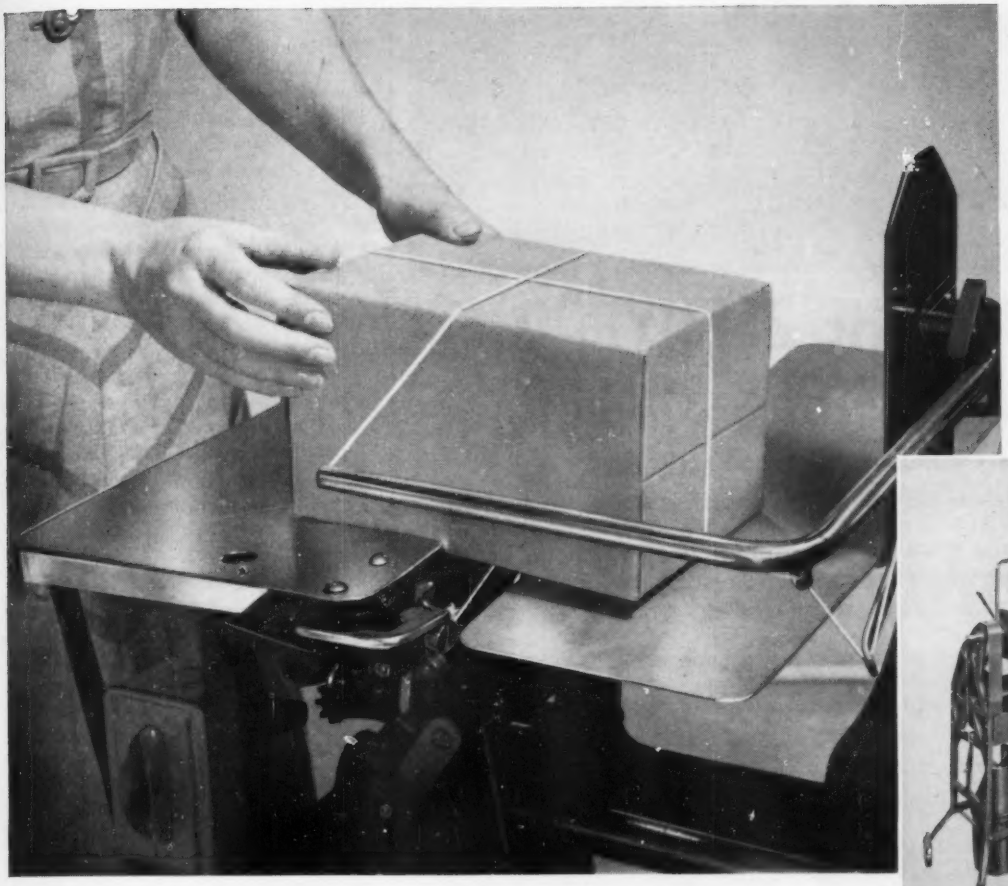
Ultrasonic.[2] This method relies on the "hammering" of two films (or foils) together at high frequency, causing them to weld without generating a temperature that would de-orient a material such as Mylar. It is the only method known that will satisfactorily weld Mylar to itself without a great loss of strength adjacent to the weld. It has, for example, found wide application in producing endless Mylar belts, which now are replacing stainless steel bands in many conveyor applications, particularly in that of food processing.

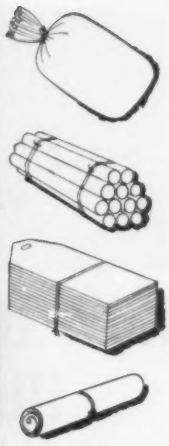
Radiant. Since radiant energy supplies most of the heat used in this method, we call sealing by means of a hot wire, rod or flame *radiant sealing.* Hot wire severing has been used on thermoplastic films for many years; materials like polyethylene, which stand high temperatures for a short time, are also commercially sealed with the aid of radiant heat, in bagmaking equipment and machinery for collapsible tube closing.

Hot melt. Where it is desired to rapidly heat seal together poor thermal conductors such as paperboard, a thin bead of molten adhesive is extruded directly onto one of the boards. The other board member is immediately pressed against the molten bead, chilling it sufficiently to effect a primary seal. This method is used for both making and closing a variety of containers, lending itself well to high-speed production.

Testing. Testing of heat seals is one of the most difficult tasks in packaging. For example, although standard laboratory procedures and equipment evaluate seal strength, such values may have little bearing on environmental performance of the seals later on. Many examples of "problem seals"

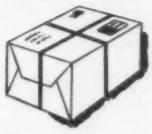
2 See "Ultrasonics: When?" p. 100 and "Ultrasonic Sealing of Foil," p. 129, MODERN PACKAGING, July, 1961.

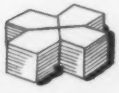


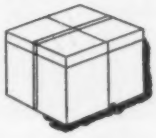




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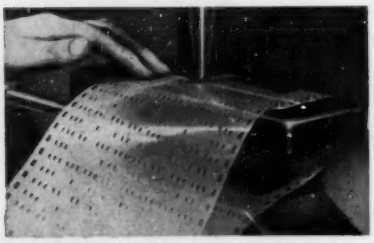


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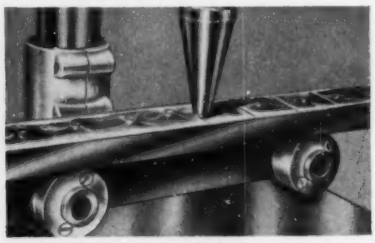
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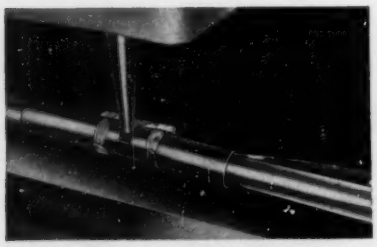
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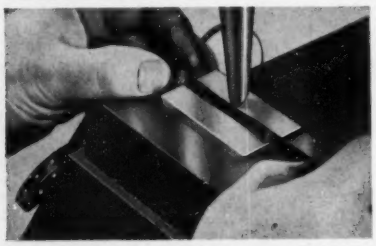
SEALS "MYLAR" PERMANENTLY The Ultra Sonic Sealer makes strong, smooth, distortion-free welds on "Mylar" strips used to program knitting machines. The machine also makes butt-lap, seam, or spot seals. No dies required.



SEALS THROUGH CONTAMINANTS The Sealer welds "Mylar" through oil to make packets of bearings in oil. The Zephyr "300" seals easily through other contaminants such as food and chemicals. It is adaptable in any position for production line use.



DESIGNED FOR IN-LINE PRODUCTION USE Polypropylene tubing formed continuously as a web of 5 mil film passes under the pulsating tool of the Ultra Sonic Sealer. Silent, safe to operate, the Zephyr "300" consumes little power. No shielding required.



SEALS WITHOUT ADHESIVES, CHEMICALS, OR HIGH VOLTAGE "Mylar" tape welded with the Ultra Sonic Sealer reduced previous bonding time by 75% for the manufacturer. Replaced use of adhesives and metal clips. Sealing operation can be interrupted without danger of burning material.

Ultrasonic sealing not only *has* the seal of approval it already *is* the "seal of approval" in plastic film bonding. The Zephyr "300", a 300 watt model, is in full production and in continuous use at many installations. Write for complete information. See it demonstrated . . . *soon*.

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will test perfect by all standard methods but fail in an environment under which the package material apparently has unlimited life. Military specifications are available for evaluating seams in barrier materials.

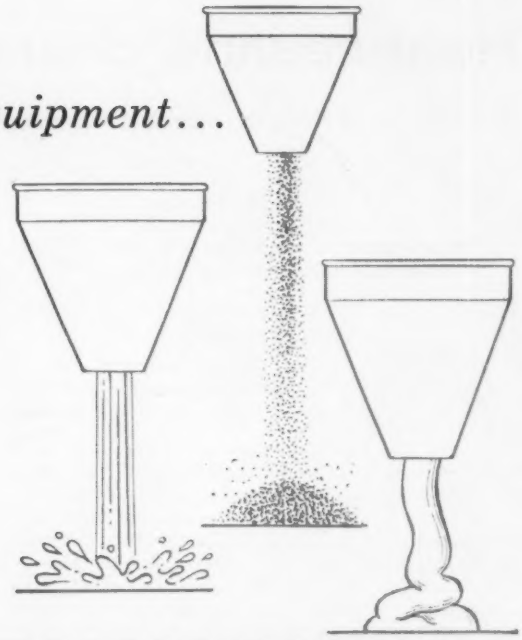
Where strong, hermetically tight seals are required, the sealing equipment selected should be used to make up pouches under the conditions of pressure, temperature and dwell thought to be optimum. These pouches may be partially filled with water containing a wetting agent (5% Igepal in water would be representative). Sealed pouches are laid on their sides for from one to 30 days, and the seals periodically evaluated on a Scott tensile-testing machine or similar equipment. Microscopic examination of seal cross-sections is also valuable—if any interface is visible, there is no true weld at the interface, regardless of tensile test results, and such seals will be likely leakers.

Avoiding contaminants in the sealing area is very important since hermetic seals generally require their exclusion, unless they may be surrounded by, or blended with, the sealant film during sealing. When packaging liquids, their cooling effect must be effectively counterbalanced both between the interfaces and outside the package in the seal area.

Package design often is of more importance than the sealing method. Face-to-face seals, without overlaps, provide a uniform heat path through the seal. Gussets and overlaps result in thicker regions. Thus a sealing temperature, which might be adequate for sealing two layers, would prove inadequate for sealing three or four layers. Raising the temperature to suit more than two layers may damage the two-layer region. Such packages require special sealing considerations even to stand a chance of being successful in hermetic applications.

Selection of the right sealing method and equipment for a particular job involves so many technical considerations that professional advice should be sought if the job is of much importance. All sealing methods are good, and most sealing machines are good, but both must be properly matched to the job. Several different methods will often do a specific job, but technical analysis generally will point up important reasons for selecting one method as best for that job; economics will then guide selection of the right equipment.

In filling and packaging equipment...

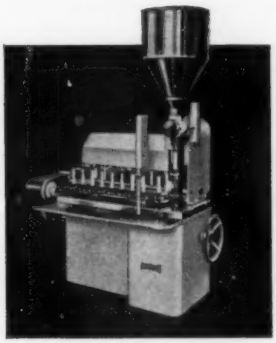


THERE'S ONLY ONE THING FINER THAN SWEDISH CRAFTSMANSHIP

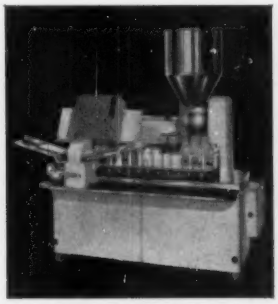
That's Swedish craftsmanship plus prompt U.S. service! And that's what you get in each and every Arenco machine. Performance that is second to none, backed by the service only fully stocked warehouses and skilled specialists can provide. For complete details, write Arenco: one of the most dependable names in filling, packaging, proportioning, closing, sealing and check-weighing equipment.



VUF automatically feeds and opens as many as 2100 bags an hour, can serve three combination weighers or portioning machines at one time. Synchronized controls maintain best filling speed, eliminating no-fills or double portioning of hard-to-handle materials. Opens each bag before filling. Handles sizes from 2½"-6¼" wide to 8⅜"-15⅛" high. Quick changeover for biscuits, breakfast cereals or granular products.



GAB automatic tube filling and closing machine packages liquids, semi-liquids and stiff pastes at speeds as high as 3000 an hour. Complete filling, with no air bubbles or pockets. "No-tube, no-fill" efficiency. Takes tubes up to 1½" in dia., 7¼" in length, 1¾" x 8" on special order. Tube-cleaning, cap-tightening, blow-off and coding device standard equipment.



GAN, "big brother" of the GAB, fills and closes up to 7000 units an hour with one operator. Automatic tube feed, photo electric tube register and dual filling nozzles. Tube discharge can be tailored to virtually any cartonning set-up. Handles tube diameters up to 1½", lengths to 7¼". Like GAB, fast changeover from size to size, product to product.



GAP heat sealer works well in combination with the GAB ... enables you to seal perfectly packages of either polyethylene or p.v.c. plastic. Easy to hook up to the parent machine. And on the GAP, precision thermostats maintain proper sealing temperatures for whichever plastic material you work with, whether production is long-run or short.

ARENCO

ARENCO MACHINE COMPANY
INCORPORATED
25 West 43rd Street, New York 36, N. Y.

Heat-sealing characteristics of materials*

Heat-sealing material	Heat-sealing range, deg. F. reciprocating jaw 0.5 sec. dwell	Process requirements				Cooling required
		Typical conditions				
		Temperature deg. F.	*Pressure*	*Dwell*	*Seal strengths*	
Films						
Cellophane	MS types[1] 250-350	300	5-20 p.s.i.	⅛ sec.	Good but not welds	No
	Polymer-coated[1] 225-350	225-425 depending on type	5-20 p.s.i.	½ sec.	Good but not welds	No
Polyethylene high-density	275-350	300	20 p.s.i.	0.2 sec. per 0.001 in. thickness	Weld seal	Preferred
Polyethylene low-density	250-350	300	10 p.s.i.	0.2 sec. per 0.001 in. thickness	Weld seal	Preferred
Polyester (heat-seal type)	275-400	325	20 p.s.i.	⅛ sec.	Good but not welds	No
Polypropylene	285-400	350	20 p.s.i.	0.2 sec. per 0.001 in thickness	Weld seal	Preferred
Polystyrene oriented	250-300	260	20 p.s.i.	⅛ sec.	Variable	No
Pliofilm	225-325	Sealable under wide range of conditions depending on grade and type			Weld seal	No
Saran	250-320	290	Approx. 2 p.s.i. (overwrap seal)	⅛ to 1.0 sec. (overwrap seal)	Weld seal	No
Vinyl	275-350	Sealable under wide range of conditions depending on grade and type			Weld seal	No
Cellulose acetate	350-450	450	50 p.s.i.	⅛ sec.	Strong to weld	Preferred
Coatings						
Paraffin wax	150-200	175	Light	Wide range	Variable	Refrigerating helps set up seals
Hot-melt compounds	200-350	300	2-25 p.s.i. depending on type[2]	Characteristically short dwell time and low pressures	Fibre tear on paper	No
Nitrocellulose	220-265, depending on formulation	240	20-40 p.s.i.	⅓ sec.	Fibre tear on paper	No
Cyclized rubber	200-250, depending on formulation	230	20-40 p.s.i.	⅓ sec.	Fibre tear on paper	No
Vinyl copolymers	180-400, depending on formulation	230	20-40 p.s.i.	⅓ sec.	Fibre tear on paper	No
Polyethylene	250-350	300	20-40 p.s.i.	⅓ sec.	Fibre tear on paper	No

*Papers, foils and certain plastics are not inherently heat-sealable but can be made so by use of proper coatings. Most synthetic films are inherently thermoplastic and do not require special coatings or treatments to make them sealable.
1 Heat requirements depend on number of layers, film type and gauge and structure of crimp or flat jaws.

Machine handling characteristics	Equipment preferred	Special considerations
Excellent	Seals well on all types	Also sealable with solvent and low heat
Good	Seals well on all types	Release after sealing can be aided with anti-stick materials like Teflon
Good	Type which can handle weld-type seal and extensible material	Good temperature controls and release surface on heated parts. Avoid sliding contact. Problem with multi-layers
Good	Type which can handle weld-type seal and extensible material	Good temperature controls and release surface on heated parts. Avoid sliding contact. Shrinkable grades available
Static eliminators helpful for fast speeds	Seals well on all types	Release after sealing aided with anti-stick materials like Teflon. Heat shrinkable grades available
Excellent	Type which can handle weld-type seal and extensible material	Good temperature controls and release surface on heated parts. Avoid sliding contact. Shrinkable grades available
Good	Bar, reciprocating or impulse	Requires good temperature control. Also sealable with solvent and low heat. Shrinkable grades available
Very good	Depends on formulation	Freshly-made seals are tacky—should be dusted if they contact each other
May require special feed mechanism	Seals well on electronic sealers above 100 ga. Below 100 ga.—hot plate, jaw or impulse	Good adjustable thermostatic controls and Teflon covered devices recommended. Shrinkable grades available
Excellent	Depends on formulation; seals well on electronic sealers	Good temperature controls and release surface on heated parts recommended. Shrinkable grades available
Static eliminators helpful for fast speeds. Critical temperature control	Requires good temperature control	Teflon coatings on heated bars desirable; also seals readily on equipment having solvent applicators
Good. Wide sealing temperature range	Carton lining equipment; overwrap equipment	Modified wax aids in more tenacious seals
Used on heat-seal labelers and packaging machines where high unit speeds are required	Seals well on all types	Most hot-melt adhesives are tailormade to do certain specific packaging jobs
Good—dependent on characteristics of the substrate material	Seals well on all types	Good temperature controls needed
Good—dependent on characteristics of the substrate material	Seals well on all types. Fin seals on all types	Coating should not be brought in direct contact with heated metal surfaces
Good—dependent on characteristics of the substrate material	Seals well on all types	Good temperature controls needed
Good—dependent on characteristics of substrate	Seals well on all types	Good temperature controls needed

2 Hot melts operate at pressures higher than simple waxes and lower than films and polymers.

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Wrapping and bundling machines

by Keith H. Redner*

Basically, a wrapping machine duplicates the finger dexterity of many human hands—always faster—and usually does it on a more consistent and uniform basis.

Wrapping machines, *per se,* have about as many forms and applications as the types of products being packaged, but their one common denominator is the efficient application of a protective overwrap. The machines are called upon to accomplish many end results such as the protective cover on a food product for the preservation of moisture, flavor, aroma or color, or to keep out foreign contamination. They also are widely used to protect from soiling or adverse handling such articles as textiles, soft goods, pharmaceuticals, candy and the like. Often the only use of the overwrap is to place on the article a forcible sales message that will inspire impulse buying at the point of purchase—as is the case, for instance, with items such as cosmetics, hardware, industrial articles and electrical equipment.

The selection of the particular type of machine depends largely on the nature of the end result desired—that is, the shape, quantity and (to some extent) size of the article to be wrapped; the type of protection desired; and the speeds required.

Quite often a company in its early growth goes through three or four typical wrapping procedures:

1. *Manual wrapping.* Used very often to test out the market or to span the period during the introduction of the product before more automatic means are required. Various accessories are available for aids to hand wrapping, such as thermostatically controlled sealing irons, slitting machines that cut the sheet to size from roll form, and stationary or adjustable heating plates that can be opened or closed to fit the products.

2. *Semi-automatic wrapping equipment.* As an aid to hand wrapping, there are semi-automatic devices that require the operator to do part of the positioning and overwrapping of the paper around the package, but multiply his productivity by performing some of the folding and sealing operations that are the most time-consuming part of the job. With this semi-automatic equipment, speeds of hand wrapping can be increased to perhaps 10 to 20 packages per minute.

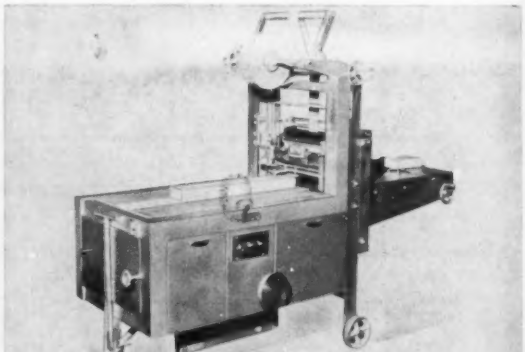
3. *Automatic wrapping machines.* The next step forward is to secure automatic wrapping equipment and these machines are available basically in three classifications: (a) slow-speed automatic machines operating in the 20 to 40 per min. range; (b) medium-speed automatic wrapping machines operating in the 35 to 70 per min. range; and (c) high-speed automatic wrapping machines operating from 75 up to more than 1,000 per minute.

There are wrapping machines available today for all these uses and speeds. The slow-speed and medium-speed automatic wrapping machines usually are readily adjustable for varying sizes and shapes of packages and are sufficiently flexible to wrap a family of related items. These machines, because of their flexibility and wide use, are reasonably priced.

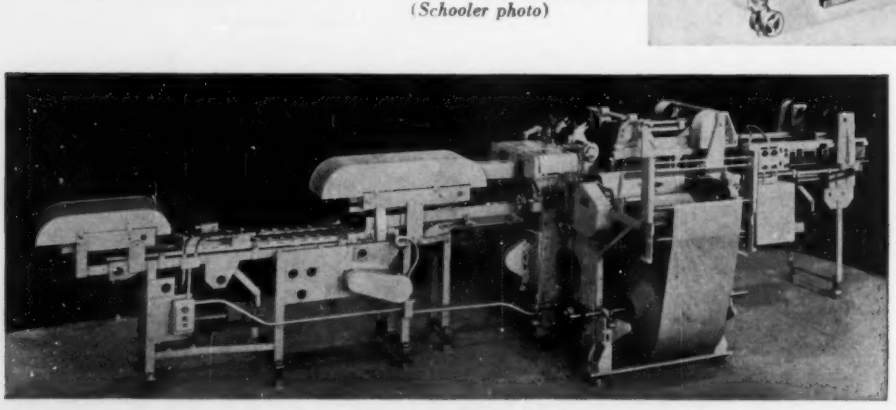
The higher-speed machines usually represent very specialized single-purpose machines for the handling of small objects such as chewing gum sticks, cigarettes, small hard candies and the like.

Irregularly shaped articles such as candy bars, soft cakes, textiles, fruit, vegetables and similar items usually require some form of rigid support against which the folds and seals can be made. These quite often are bot-

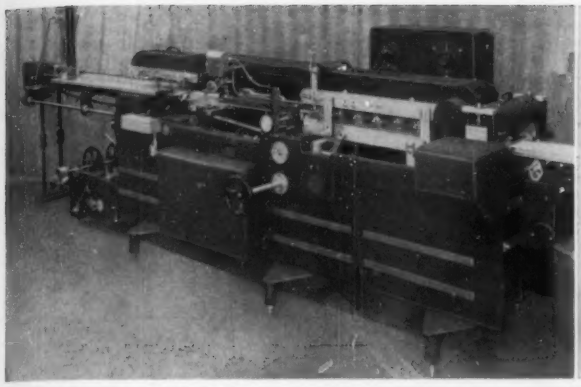
*Vice President, Battle Creek Packaging Machines, Inc., Battle Creek, Mich.



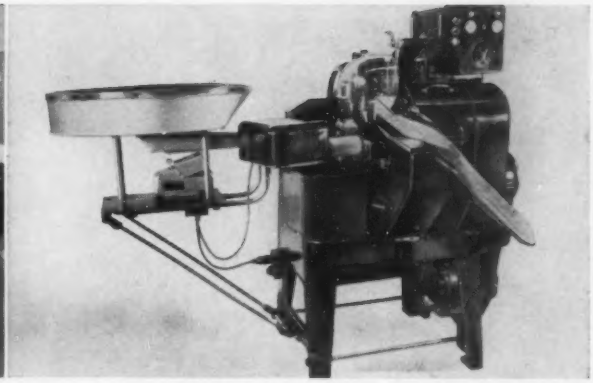
BANDING unit automatically applies seamless cellophane, waxed paper, foil or kraft bands to square or rectangular packages—for sales, identity, introductory, seasonal or other messages on one or more sides. Speeds, 30 to 60 bands a minute. Unit adjusts to wide range; bands single or multiple units; uses continuous or spot print with electric eye. (*Schooler photo*)



BUNDLE-WRAPPING unit is equipped with "in line" collector, printer and circulating glue system. (*Battle Creek Packaging Machines photo*)



FLASHLIGHT BATTERIES, two to a package, are wrapped in 2-mil polyethylene at the rate of 40 to 60 wraps a minute. Features include shuttle feeder, hot wire tube seal and wrap tighteners. (*Hudson-Sharp Machine Co. photo*)



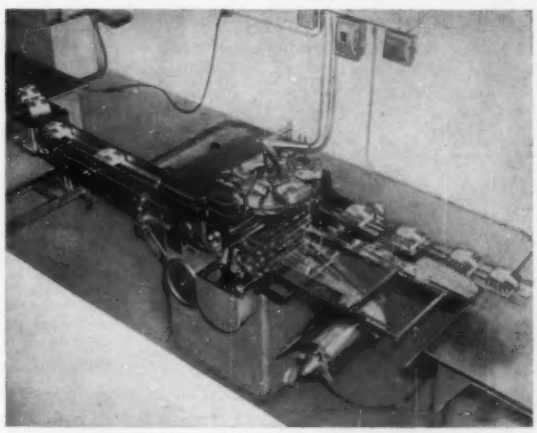
TWIST WRAP MACHINE wraps candies at speeds up to 230 pieces a minute. Removable automatic candy feed contributes to higher speeds and lower labor costs. The machine handles filled candies gently. (*Package Machinery Co. photo*)

tom boards, scored boards that are formed into a U-shape, three-sided and four-sided trays and similar supports. The open-faced paperboard tray is growing in popularity for irregularly shaped products or multiple units because it provides visibility, is easily assembled on tray-forming machines and is adaptable to practically all standard wrapping machines. The drawing on page 474 illustrates some of the paperboard forms that may be used with conventional wrapping machines to handle irregularly shaped articles or multiple units.

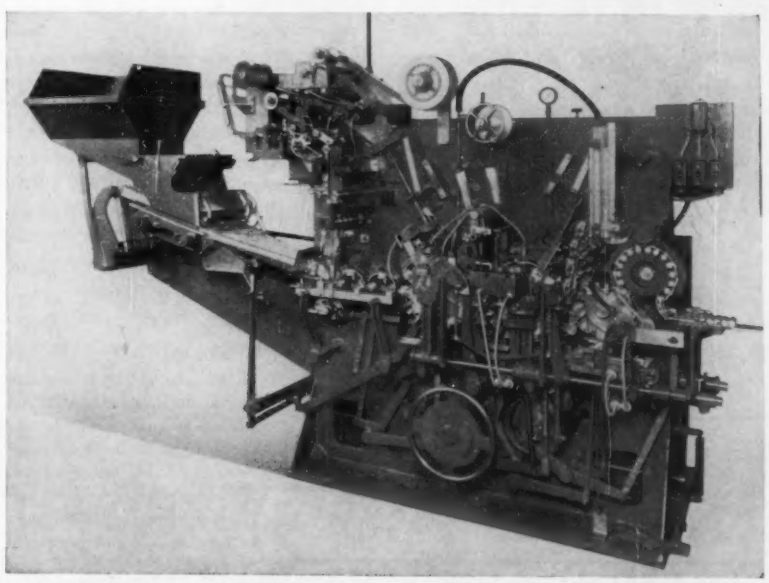
Recently, several new wrapping machines were introduced to handle the new soft plastic films. Some of the new wrapping machines are single-purpose units (that is, designed to handle only one type of plastic film). Other machinery manufacturers have been able to develop sealing systems that will accommodate most, if not all, of the plastic films with the result that the user can switch from one film to another to match the particular marketing problem with which he is faced on the different packages and products that he produces.

Along with these developments in machinery, the film manufacturers themselves (and this is particularly true of polyethylene—see page 120) have continued to perfect their films for better machinability, better transparency and better printability. Consequently, the swing toward the plastic films as an overwrapping medium has accelerated rapidly.

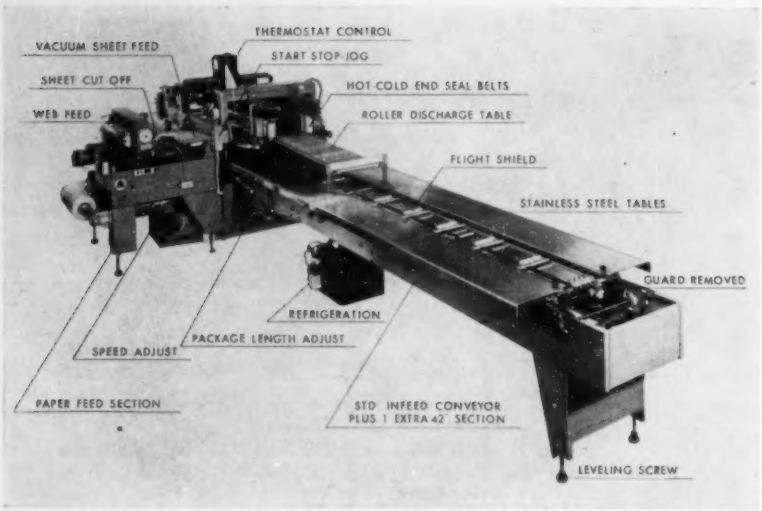
The trend in the next few years should show more and more packages being marketed in the new films, not only because of their low cost but



LUNCHEON MEATS. This standard machine overwraps meat in heat-sealing cellophane, saran, Cryovac, polyethylene or polyester film at speeds from 30 to 65 packs per minute. Positive registration of preprinted film is supplied. Change parts for differently shaped products are available. (*Photo, Crompton & Knowles*)



COMPLETE PACKAGING of items such as mints, fruit drops and digestive aids. Machine counts and wraps the product in wax paper, going around the product twice and heat sealing the long seam; then it wraps packages in unmounted foil and sprays liquid paraffin into ends of the seal. Paper-backed foil with wax impregnation may be used. Roll packages have tear tape; banded with label wrap. (*F. B. Redington photo*)



POLYETHYLENE and other plastic films, cellophane and waxed paper are wrapped by this machine around a wide size-range of products—either singly or in groups. Important operational points are designated on the photo. Bottom and end seals possible are: (1) over-all bottom heat seal; (2) narrow bottom line seal (to minimize any film distortion); (3) over-all end heat seal and (4) narrow line seal at each end of the package. (*Oliver Machinery photo*)

also through many inherent values in some of the new films that make for longer shelf life, dimensional stability and better product protection.

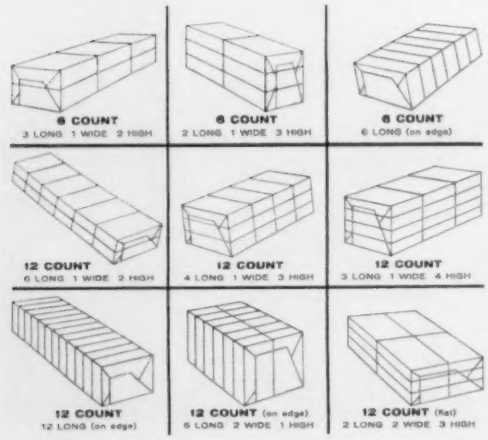
Because the American economy typically changes rapidly, most manufacturers demand wrapping machines that are versatile and flexible in the handling of different package sizes, as well as different overwrapping films. As a result most of the standard wrapping machines available today are designed for quick and easy conversion from one package size to another, for a series of family or related products. The exceptions are usually those specially built machines that handle irregularly shaped products such as cigars, lollypops, round candies (twist wrap), round chocolate mint patties or the like. Increased self-service outlets have necessitated more care in properly protecting and labeling the articles to be distributed. The result is that more and more devices are continually being developed, for use with overwrapping machines, to bring the package to the market with proper sales impact and product identification.

Special attachments. "Electric eye" devices are available for use on almost all automatic wrapping machines to scan the printed design and register the printing accurately on the package being wrapped (usual tolerances being plus or minus 1/16 inch). Easy-opening devices of various types are also available with many wrapping machines to provide a pull tab, tear tape or a notched opening for quick access to the package. Some of the newer plastic films such as polyethylene require special devices to apply a scoring line on the film for quick access to the package.

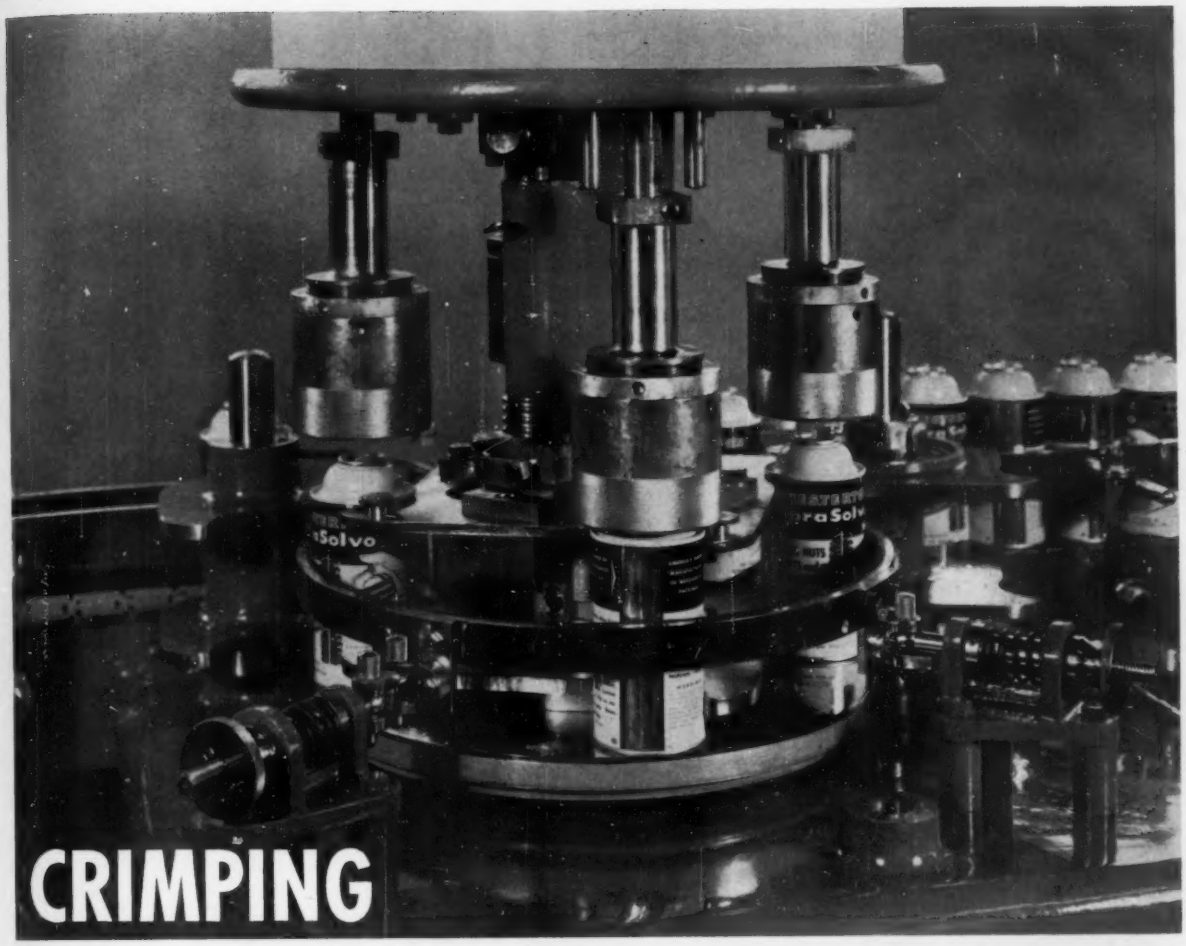
Attachments also are available to apply identifying thermoplastic-coated labels to the package as well as to imprint the labels just prior to heat sealing the label to the overwrap. With certain machines, such as for bread wrapping, a thermoplastic coated label also may be applied to the two ends of the package—both for sales impact at the retail level and for more positive package sealing.

Special feeding attachments can sometimes be incorporated in wrapping machines to deposit a circular, booklet, or coupon in or on top of the package. Devices have been built to apply advertising bands around the package or to feed automatically cut-to-size bottom cards or U-boards. Printing machines are available that can print a design on the web of paper as it is unwinding into the wrapping machine. The machinery manufacturers are certainly an ingenious group in developing all manner of attachments to enable a user to fit his merchandising into the needs of self-service outlets.

A variation in overwrapping machinery that has recently gained some popularity is in the group wrapping of more than one unit into what is commonly called a bundle. This approach has taken a number of different directions such as special "economy sales" where from two to six of the same products are group wrapped together for special merchandising offers. Typical examples are groups of food packages, dentifrices, soap and the like. Another trend has been the use of group overwrapping to obtain multiple sales at the retail level, such as six or eight candy bars, six or eight cereal packages, or similar combinations for supermarket sales. From a merchandising point of view, multi-unit packaging is increasingly important and the wrapped multi-unit package produced on high-speed wrapping machines is finding special favor because of economy, versatility and effectiveness. Still another use of bundle wrapping machines has led to elimination of the box for multiples of particular products; instead, the multiple units are overwrapped with



BUNDLING arrangements. Shown here are basic arrangements that can be handled on automatic equipment. Advantages of bundling are reduction of costs by using inexpensive materials; easier and more efficient stock handling; better displays and important new opportunities for promoting multiple-unit sales. (*Battle Creek drawing*)



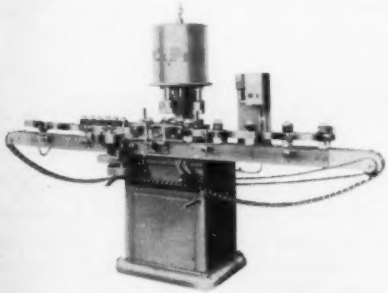
OVER 1,000,000 CANS...and going STRONG

A recent customer reports the new CAPEM Automatic Rotary Crimper for Aerosol Valves delivers more than a million cans without a sign of jaw or plunger wear or misalignment. The crimper assembly holds well within crimping tolerance throughout the entire run.

The machine features a completely mechanical operation . . . no *air* required. During the crimping operation, a mechanical plunger drops over the valve and expands 6 precision tooled segments for crimping contact. When the plunger retracts, the segments snap back into position for positive release of the can *before top pressure is released.* The crimping operation is further protected by Consolidated's built-in accuracy of container handling and centering, with automatic pre-seating of unseated valves.

Crimper jaws are adjustable to provide depth of crimp desired. The machine, with adjustable turret can be easily set for proper crimp height and top pressure.

The Model C-4-SC, 4-spindle operation shown, will handle any size can with standard 1" valve at speeds of 110 to 120 containers a minute. Faster six and eight spindle machines are available.

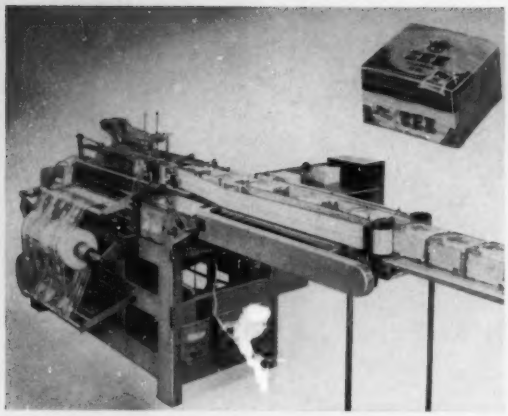


For complete information, write Sales Manager

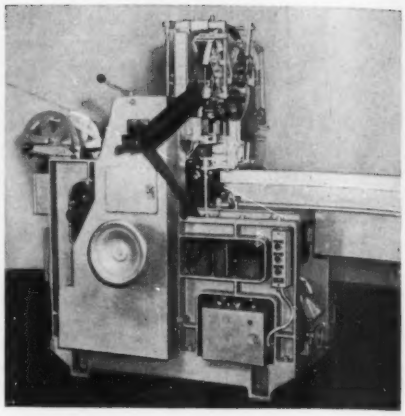
CONSOLIDATED PACKAGING MACHINERY CORPORATION

A Subsidiary of International Paper Company

1400 WEST AVENUE • BUFFALO 13, NEW YORK



PAPER NAPKINS wrapped in polyethylene by machine adapted to handle variety of films, meet individual requirements. (*Hayssen photo*)



BAKERY products (small) automatically stacked, wrapped in cellophane, sealed, labeled; tear tapes applied. Handles 120 or more packs a minute. Size range: diameter, 1⅝ to 2 in.; height, 1½ to 2¼ inches. (*Wright Machinery photo*)

a strong kraft paper, polyethylene sheet or similar material. Typical examples include drug products, match boxes, food packages and so on through a long list. It is in the bundling field also that some of the newer plastic films prove of value for giving added strength to the bundled packages as well as visibility to the contents. The potentials here are challenging and alert packagers will do well to investigate them.

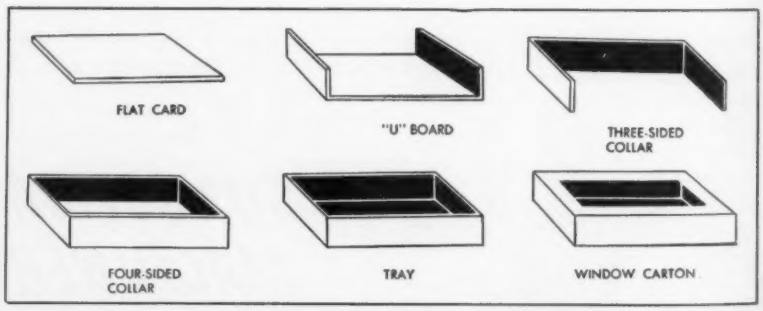
The bundle may be wrapped in paper, plastic film, paperboard, corrugated paper or similar materials. Seals may be made by heat or glue, and separate end labels may be applied to the package by glue or heat to identify the contents or to enhance the package. Many of the same attachments mentioned earlier in this article for use with overwrapping machines are also available for use with bundle-wrapping machines, such as the electric eye to register the printed design on the bundle, easy-opening devices to facilitate quick access to the contents, labeling attachments, printing attachments and the like.

It is also possible to provide automation with bundling machines to collate, unitize and feed multiple groups of packages automatically to the infeed of the machine. Many striking examples of automatic collectors and feeders have been developed by the manufacturers. As the elimination of hand labor is one of the prime factors in considering bundling machines in the packing room, the expense of special designs to incorporate automation in the packaging line can usually be justified through the savings that result. A bundling machine that will form a shipping wrap from a wide variety of materials, and thus produce a container that will adequately protect the packages during storage and shipment, can be a wise investment.

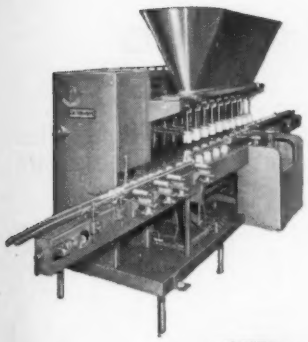
From the foregoing it will be apparent that, where an industry-wide demand has developed, the wrapping machinery manufacturers have been able to design machinery that, perhaps with some minor modifications, can be used for almost any conceivable wrapping problem. Whenever machines are manufactured in quantity to fit the whole industry's use, it is axiomatic that the cost of the machine can be reduced and all users can benefit from the lower prices. Custom-designing of a special overwrapping machine is an extremely expensive proposition. This is because parts for such a machine must be manufactured in single-quantity lots, which naturally increases their cost, and also because the manufacturer assumes a responsibility for engineering and successful design and performance that cannot be spread over more than one unit and must therefore be carried in the cost of a single machine for the purchaser's single advantage.

It is always wise to consult with the machinery manufacturers before deciding on a new package design as quite often a small dimensional change represents the difference between a more or less standard machine, at a reasonable price, and a special machine that might cost many thousands of dollars more.

The importance of selecting the proper wrapping machine in your packaging line cannot be too strongly emphasized. At the time you bring your product to the machine for packaging, it has been upgraded to the point of its highest value prior to departure from the plant itself. Material, labor, overhead and preparation have gone into its value—plus a great deal of expense, thought, promotion and advertising. Very often the only salesman you have for your product on the retailers' shelves is the appearance of the package itself. Therefore it is of utmost importance that you select the wrapping material, the package design and, finally, the best machine to creat the finished appearance of the package on which you necessarily depend for your sales impact at point of purchase.



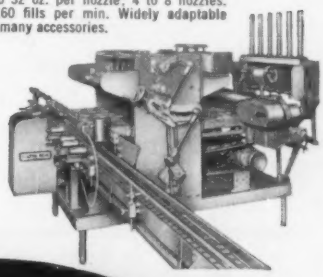
PAPERBOARD SUPPORTS. These basic forms make it possible to wrap irregular and fragile products at high speeds on standard equipment and, at the same time, to obtain the desired strength, neatness and economy. (*Scandia drawing*)



No. 19A Colton-Hope High-Speed Automatic. Fills liquids, creams, pastes into bottles, jars, cans. ¼ oz. to 32 oz. per nozzle; 4 to 14 nozzles. Up to 250 fills per min. Many accessories available.

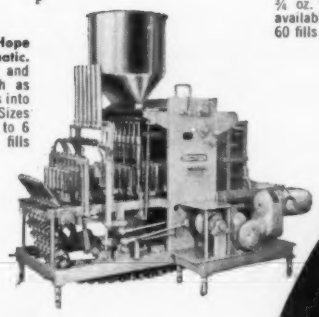


No. 19 Colton-Hope High-Speed Automatic. Fills liquids, creams, pastes into bottles, cans, jars. Excellent for filling, top-finishing, disc-placing in cosmetic cream work. ¼ oz. to 32 oz. per nozzle; 4 to 8 nozzles. Up to 160 fills per min. Widely adaptable through many accessories.



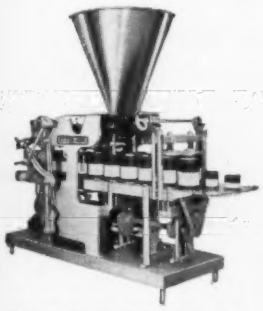
No. 15RF2 Colton-Hope Two-Line High-Speed Automatic. Fills liquids, creams, pastes into glass, plastic, tin, paper containers. ¼ oz. to 32 oz. per nozzle; 1 or 2 nozzles available. Many outstanding features. Up to 60 fills per min. Many accessories available.

No. 27 Colton-Hope Heavy-Duty Automatic. Fills high viscosity and ropy materials such as caulking and greases into tubes or cartridges. Sizes up to 2" x 10"; 2 to 6 nozzles. Up to 90 fills per min.

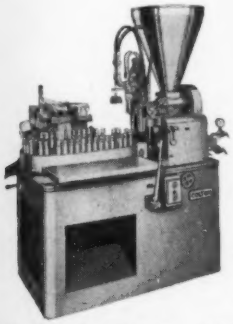


The money-saving precision of **COLTON** **exacto-metric filling** plus **high operating speed** make basic Colton fillers the big buy

These basic fillers typify the wide range of filling covered by the Colton line—most complete and versatile in the world. Such basic machines, readily adaptable to individual application by means of accessories engineered to the machine, give, in effect, a custom-engineered machine at standard machine price. It is this adaptability that enables us to say "Colton fills practically ANYTHING into ANYTHING." Many other Colton fillers available. Write for Filling Machine Application Data Sheet. Detailed specification sheets available. Arthur Colton Company, 3400 E. Lafayette Ave., Detroit 7, Michigan. Sales and Service offices throughout the country. Plants: Detroit, Mancelona, Elk Rapids, Michigan.

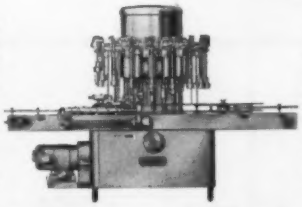


No. 21 Colton-Hope Single and Twin Automatic Conveyorized Heavy-Duty Filling Machine. For filling liquids, creams, light and heavy pastes such as paints and similar products into jars and cans. Production up to 10 cycles per minute per nozzle. Fills up to 1 gallon per nozzle. 1 and 2 nozzles available. Paint can lid dropping and pressing features available.



No. 175 Colton Automatic Tube Filler, Closer and Crimper with Ejector.* Fills liquids, creams, pastes into tubes, small bottles, jars, cans. Cleans, fills, folds, crimps, ejects. Various fillers offer 30 to 300 tubes per min. per machine.

***No. 176 Plastic Tube Sealing Attachment;** low cost conversion unit to replace standard folding heads on Models 17TF and 175TF machines. Gives dual-purpose machine handling metal or plastic tubes. Model 172 Colton exclusively for high speed sealing of plastic tubes.



No. 116 COLTON VOLUMETRIC HIGH-SPEED ROTARY FILLER Liquids, creams, pastes into jars, bottles, cans up to 10" high, 4" dia.: ¾—32 fl. oz.: 110-320 containers per min. Exact fill control, "no-can-no-fill" device, bottom-up fill, 8" rise platforms each station. Timing screw container feed. Hopper, 35 gal. Straight line stainless steel conveyor system 10' long. 8-pocket infeed starwheel; 12-pocket discharge starwheel.

PACKAGING MACHINERY MANUFACTURERS INSTITUTE PMMI

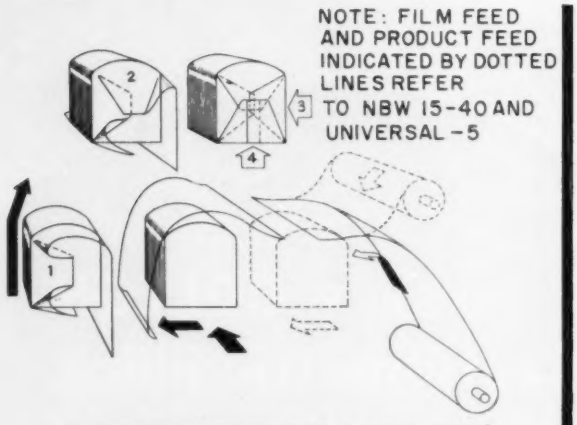
COLTON fills practically ANYTHING into ANYTHING



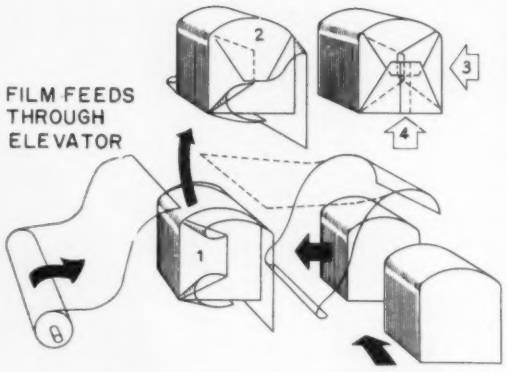
Fold patterns for wrapped packages*

For identification of typical machines that produce any of the folds illustrated on these pages, see bottom of page on which diagram appears.

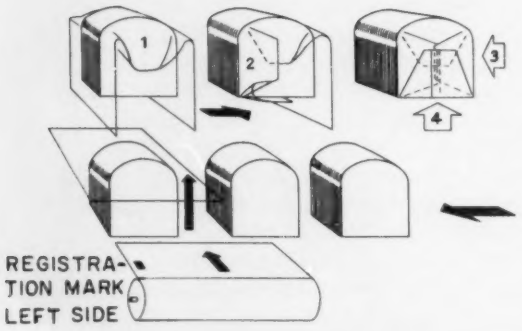
General Wrapping (Nos. 1-12)



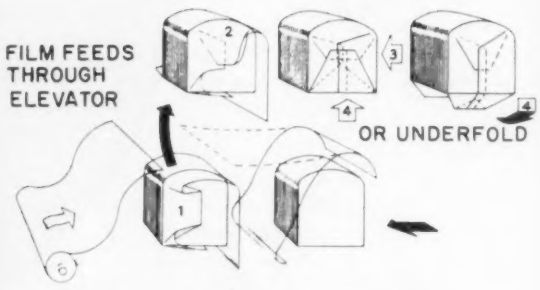
1-PROGRESSIVE END LOCK FOLD



2-PROGRESSIVE END LOCK FOLD



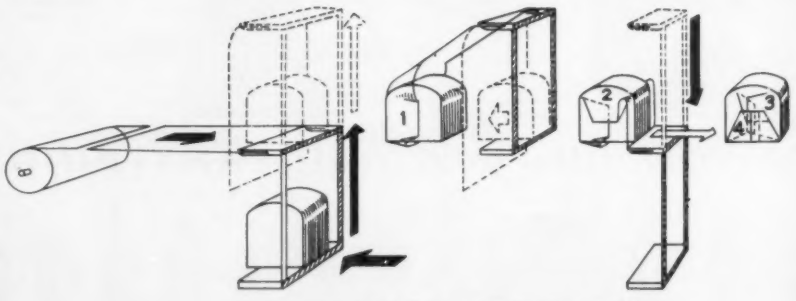
3-PROGRESSIVE END LOCK FOLD



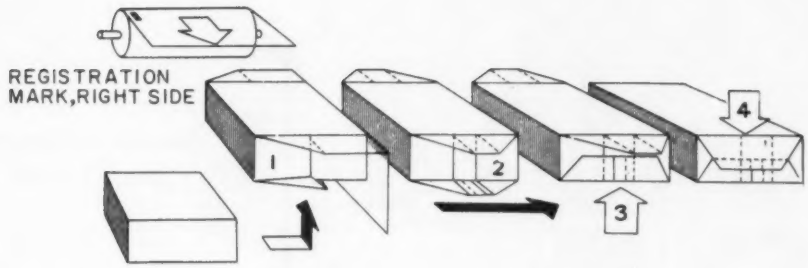
4-PROGRESSIVE END LOCK FOLD (END FILM FEED)

*Several diagrams courtesy E. I. du Pont de Nemours. Diagrams shown are representative of methods in use today, but additional, newer and improved methods may be available. See also "Machines, Wrapping," p. 796.

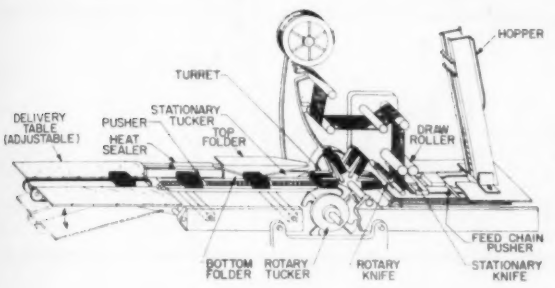
(1) End Lock—American Machine & Foundry Standard; End Lock or Underfold—National Bakery Div., Package Machinery Models 15-40 and 25-60; Package Machinery Models F, U-4, U-5. (2) Gellman Producer 718, Syncro-Matic, Variety. (3) Hayssen Bread, Hayssen Tomato. (4) End Lock—Oliver Models 799 (A-C-D) and 799 (AM); End Lock or Underfold—Oliver Model 799 (H to P). (5) General Universal Bread and Universal Carton.

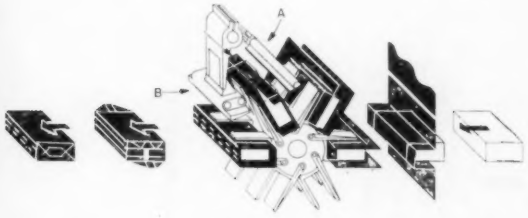


5-PROGRESSIVE END LOCK

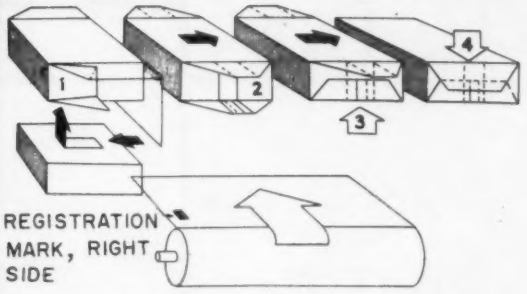


6-DOUBLE POINT END FOLD

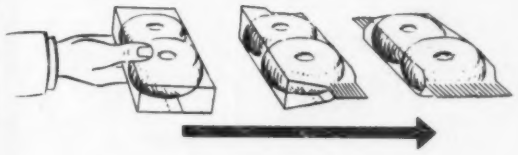




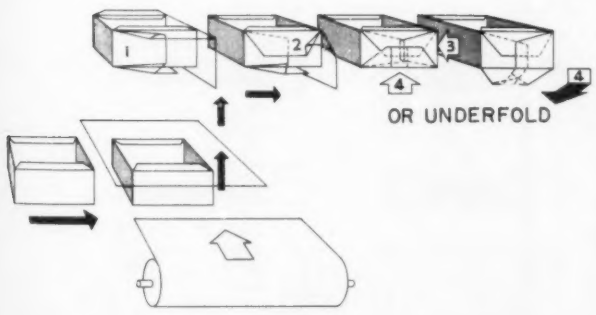
7-CIGARETTE FOLD, TURRET TYPE



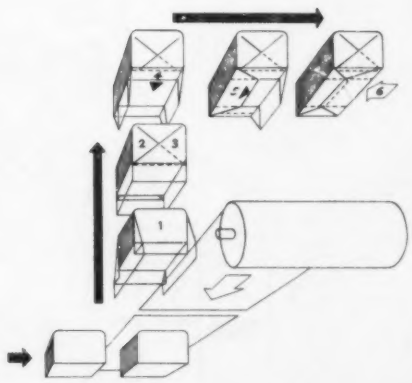
8-DOUBLE POINT END FOLD



9-CRIMPED END SEAL



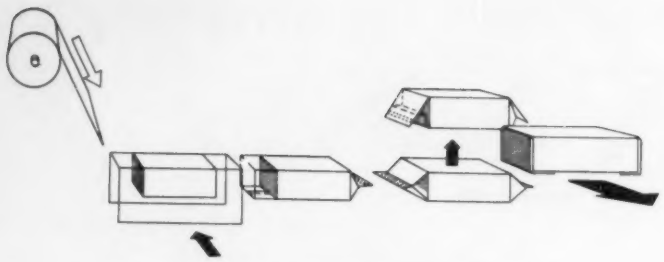
10-PROGRESSIVE END LOCK FOLD
(SIDE FILM FEED)



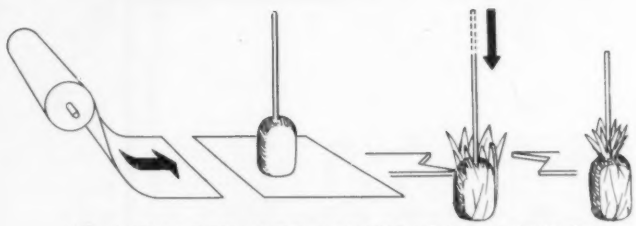
11-DIE FOLD

(6) Knapp Models JS and KW; Package Machinery Models FA and FF. (7) Scandia Model 708. (8) Hayssen Carton. (9) Pack-Rite Krimpac; Package Machinery Model F-5; Miller Thin Wrap. (10) End Lock—Battle Creek Packaging Machines Model 46; End Lock or Underfold—Battle Creek Packaging Machines Model 43. (11) General Wrapping: Lynch Corporation Models L.P.B. and P.B. Candy Wrapping: Lynch Corporation Model RA; Package Machinery Model DF.

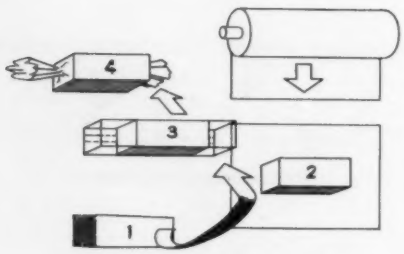
Candy Wrapping
(Nos. 13-24)



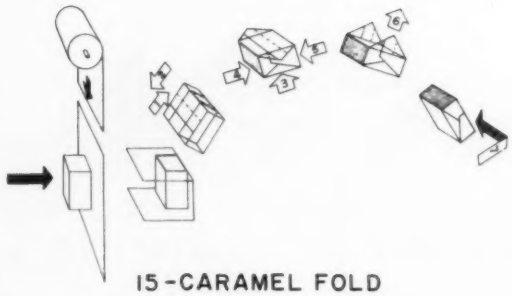
12-CAMPBELL WRAPPER SEAL



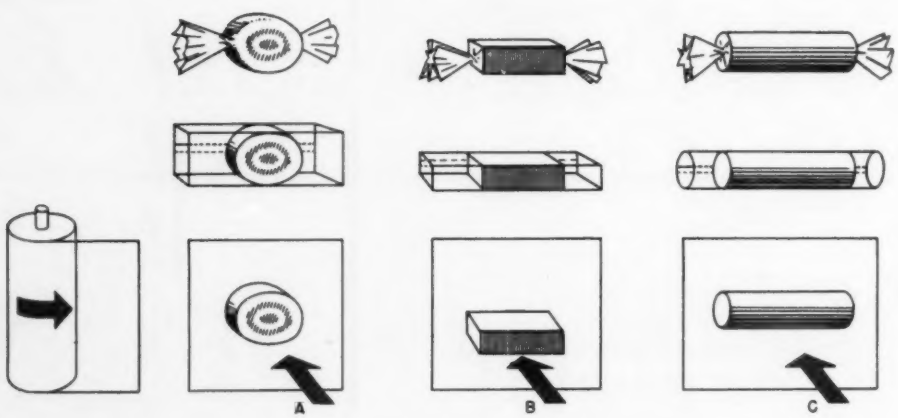
13-LOLLIPOP WRAP, HEAT SEAL GATHER



14-TWIST WRAP

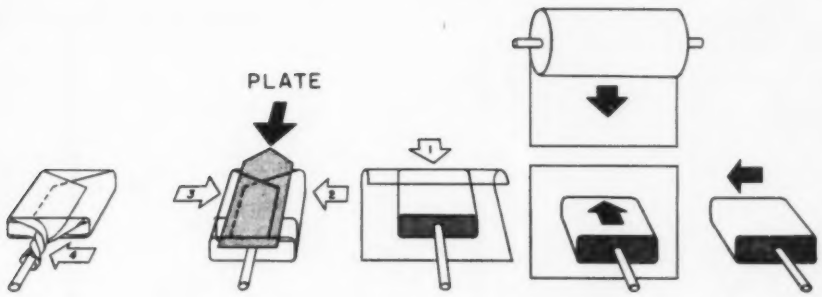


15-CARAMEL FOLD

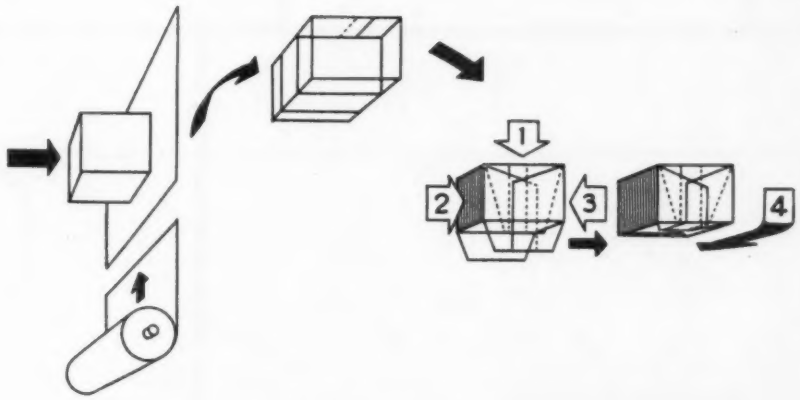


16-TWIST WRAP

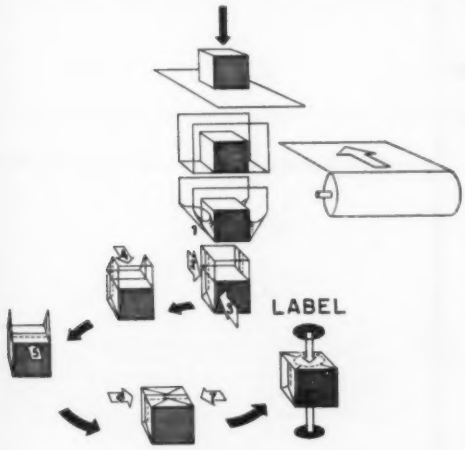
(12) Hudson-Sharp (Campbell). (13) Goodwyn Jacketeer. (15) National Equipment Rose Eagle; Package Machinery Forgrove Model 42-B. (16) Package Machinery Models K & KH.
(14) National Equipment Rose Albion and Rose Triumph.



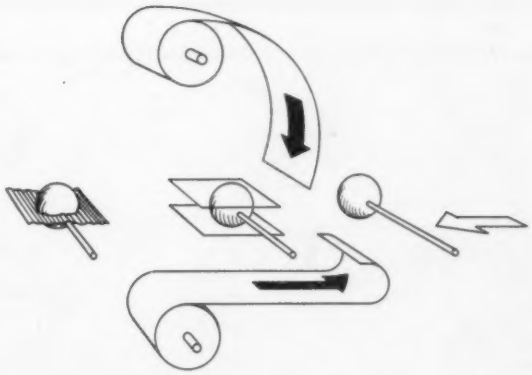
17—PACKAGE MACHINERY LP-3 WRAP



18 CARAMEL WRAP

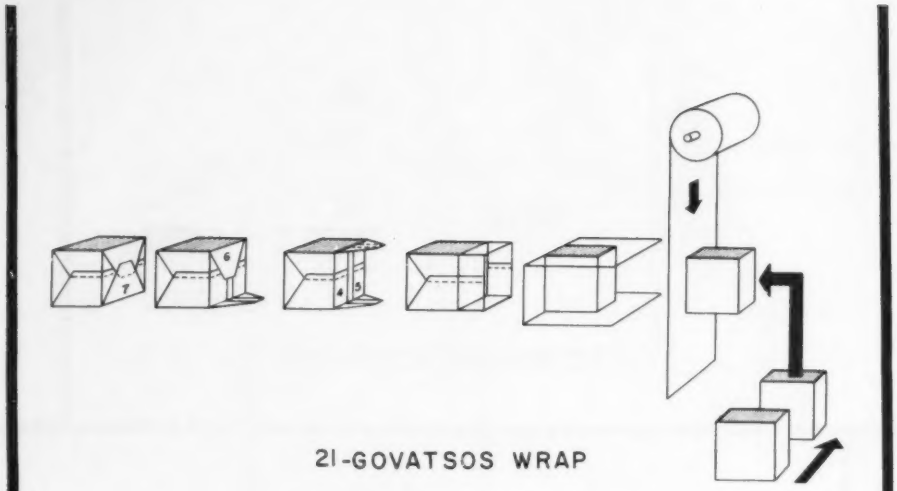


19 - WRIGHT WRAP

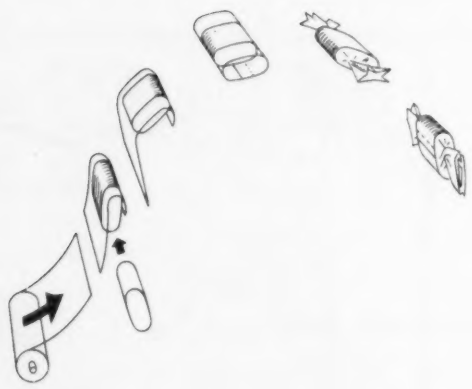


20—LOLLIPOP WRAP

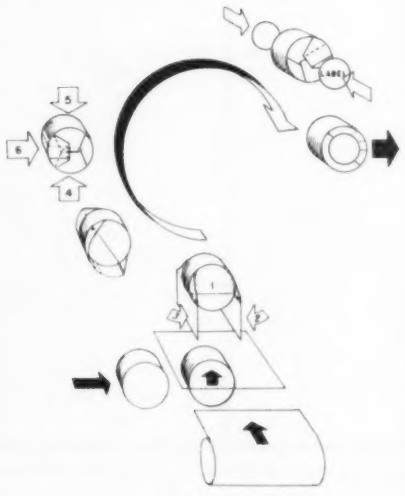
(17) Package Machinery Model LP-3
(18) Ideal Wrapping Machine Co. (Middletown, N. Y.) Senior and Special.
(19) Wright Machinery Wrap.
(20) Wrap-Ade Model KH.



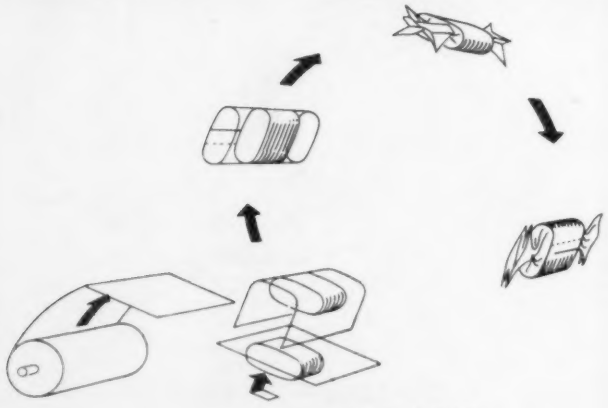
21-GOVATSOS WRAP



22-TWIST WRAP



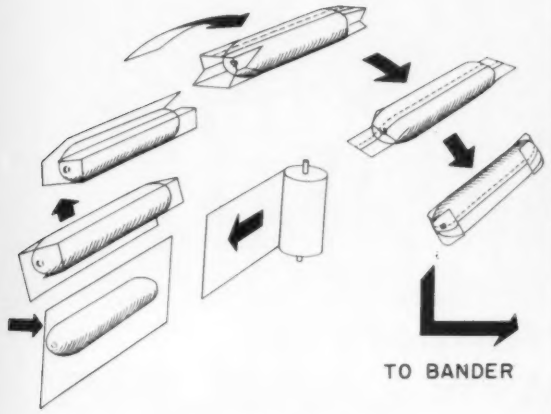
23-LYNCH WRAP



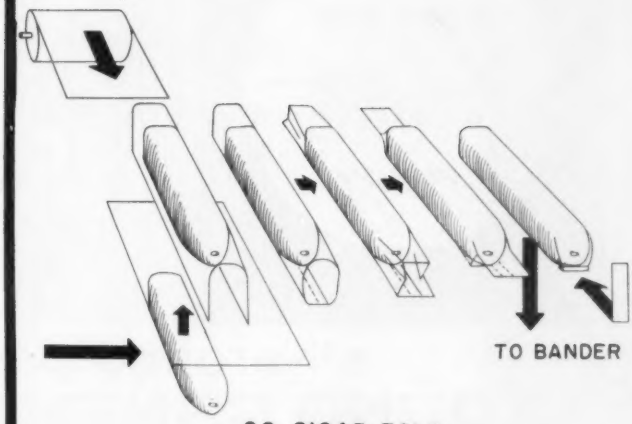
24-TWIST WRAP

(21) Govatsos Wrap. (22) Aurelio Tanzi Acma Model 722. (23) Lynch Corp. Wrap. (24) Bunch—National Equipment Rose I.S.B. Twist—National Equipment Rose I.S.T.; Package Machinery Forgrove Models 22-B and 42-C.

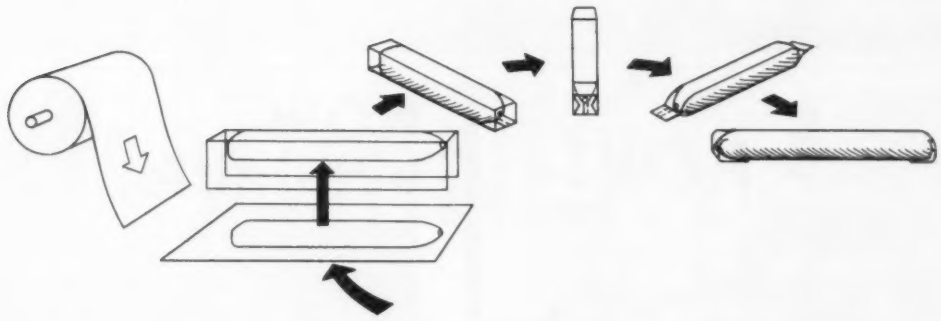
Cigar Wrapping (Nos. 25-28)



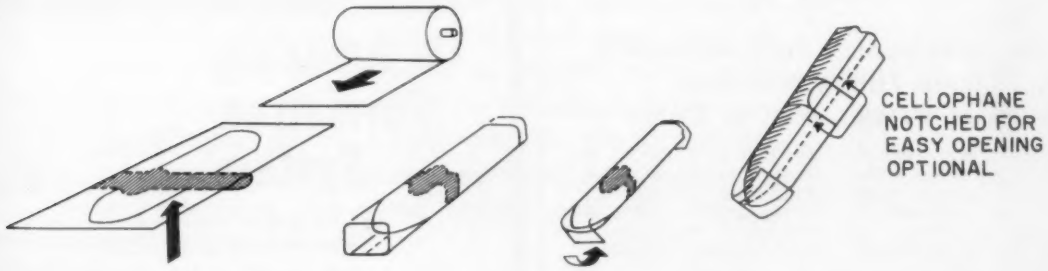
25-CIGAR FOLD



26-CIGAR FOLD



27-CIGAR FOLD



28-CIGAR FOLD

(25) A.M. & F. Model 3-53 (Converted Foiler).
(26) A.M. & F. Model 3-88.
(27) Package Machinery Model 16.
(28) Consolidated "Colton-Voice."

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all-around performers for ROUND CONTAINER LABELING

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● Containers are completely controlled throughout intake, filling and discharge cycles. Filling time is adjustable to allow for container size and product viscosity, thus allowing more rapid fill. Changeover to various bottle sizes is quick—no star wheels. Fill containers from ½ to 128 ozs., with I. D. necks from ⅛", heights from 1" to 15". Fully automatic overflow.

WRITE FOR ILLUSTRATED BULLETIN B-2

ERTEL ENGINEERING CORPORATION
3 FAIR STREET · KINGSTON, N. Y.
Manufacturers of Filters, Filter Sheets, Vacuum Bottle Fillers, Pumps

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HAYSSEN AUTOMATIC PACKAGING MACHINERY

HAYSSEN AUTOMATIC PACKAGING MACHINERY

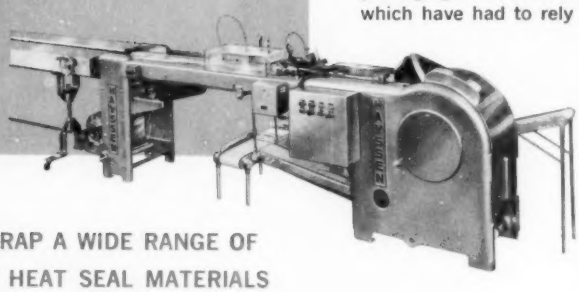
Every Hayssen packaging machine combines the latest in technological advances with time-proved design principles resulting from more than 50 years experience in the manufacture of packaging machinery — exclusively. Consequently, whether you package liquids, powders, granules, solids, or soft goods in board, paper, film, foil, metal or glass, you can count on Hayssen machinery for packages that will appeal to the consumer, protect your products and put more profit into your production. Contact your local Hayssen representative; he is as close as your telephone. Get all the facts on cost-saving Hayssen packaging equipment.

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BABY BLANKETS
BABY JACKETS
BATH ROBES
BATHING SUITS
BED JACKETS
BED SPREADS
BEER
BLANKETS
BOXED CANDY
BRASSIERES
BREAD
CAKE MIX
CANDY BARS
CAPS AND SPORT VISORS
CATSUP
CEREALS
CHEESE
CHEESE CLOTH
CHEMICAL CLOTHS
CHEMICALS
CLEANING CLOTHS
CLOTHES LINE
COCOA
COFFEE
COTTON BATTING
COTTON GAUZE
COTTON SURGICAL SUPPLIES
COUGH DROPS
CRACKERS
CRANBERRIES
CRIB SHEETS
CURTAINS
DESSERT MIX
DIAPERS
DOUBLE AND ROLLED BOLTS OF CLOTH
DRAPES
DRIED BEANS, RICE, PEAS
DRIED DOG FOOD
DRIED MILK
ELECTRICAL GOODS
EXTRACTS
FABRIC BELTS
FILLER PAPER
FISH
FLAVORING POWDERS
FLOUR
FRESH FRUIT
FRESH VEGETABLES
FROZEN FOODS
GAMES
GELATIN
GLOVES
HANDKERCHIEFS
HARDWARE
HORSE RADISH
HOSIERY
ICE CREAM
ICE CREAM MIX
INDEX CARDS
INDUSTRIAL CLOTHS
INDUSTRIAL UNIFORMS
JAMS
JELLIES
KNITTED MOCCASINS
KNIT WEAR

HANDY INDEX TO **HAYSSEN** AUTOMATIC PACKAGING MACHINERY

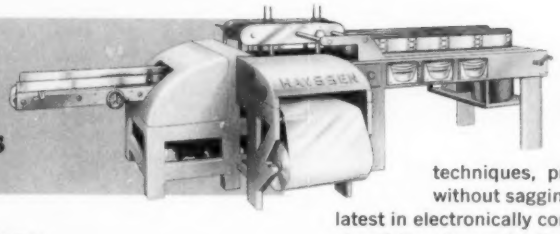
HAYSSEN RT COMPAK



AUTOMATICALLY OVERWRAP A WIDE RANGE OF PRODUCTS IN GLUE OR HEAT SEAL MATERIALS

Here's the machine that bridges the gap between vertical packaging and overwrapping equipment. Now, industries which have had to rely on cumbersome costly slow speed or hand packaging methods can enjoy the economies and convenience of completely automatic packaging. The Hayssen RT is low in initial cost; operates on heat sealable or pressure sensitive films; can handle a remarkable range of product sizes without change parts; requires no U-boards, cards or stiffeners and operates at production speeds of up to 100 units per minute.

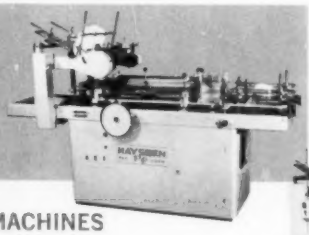
HAYSSEN NEW HIGH SPEED OVERWRAPPERS

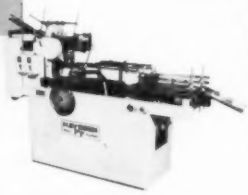


FOR AUTOMATIC, HORIZONTAL, CONTINUOUS MOTION PACKAGING

Hayssen's new line of high speed wrapping machines incorporates a new type rotary shear and continuous motion paper feeding mechanism which, when combined with time-proved folding and sealing techniques, produces tightly wrapped packages without sagging or rounding of package ends. The latest in electronically controlled drive mechanisms provides simplicity of speed adjustment, positive break action and maximum service life. Built-in flexibility handles a wide range of product sizes with an absolute minimum of downtime.

HAYSSEN PAC-FORM

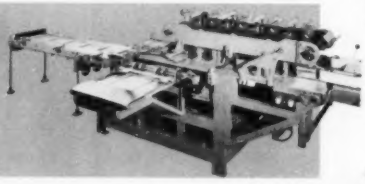


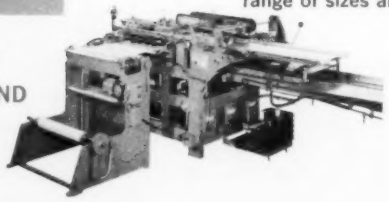


A COMPLETE LINE OF MACHINES FOR FORMING CARTONS WITH HEAT OR GLUE SEAL MATERIALS

Hayssen Pac-Form machines incorporate a patented heat sealing technique which furnishes production rates of up to 180 cartons per minute using pre-applied thermoplastic adhesives or plastic coated board. Pac-Form machines are also available for handling other heat seal carton materials as well as units for forming conventional glue seal cartons. Choose from high speed models and intermediate speed models to suit your needs. Besides forming top opening, edge opening and end opening hinged cover cartons, Hayssen Pac-Form machines can set up a wide variety of glue or heat sealed trays.

HAYSSEN STANDARD WRAPPERS





OVERWRAP AN ALMOST UNLIMITED VARIETY OF PRODUCTS IN POLYETHYLENE, PLASTIC AND OTHER HEAT AND GLUE SEAL MATERIALS

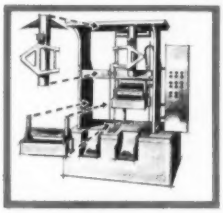
Hayssen's standard line of wrapping machines are leaders in the industry for advanced design features, simplicity of construction and around-the-clock dependability. Compact and rugged, these machines have fewer moving parts, require a minimum of maintenance and are easy to operate. Built-in flexibility lowers downtime for changeover and allows adjustments to accommodate a wide range of sizes and packaging materials. From absorbent cotton to watch bands, Hayssen wrappers produce neater, more appealing packages — faster and more economically.

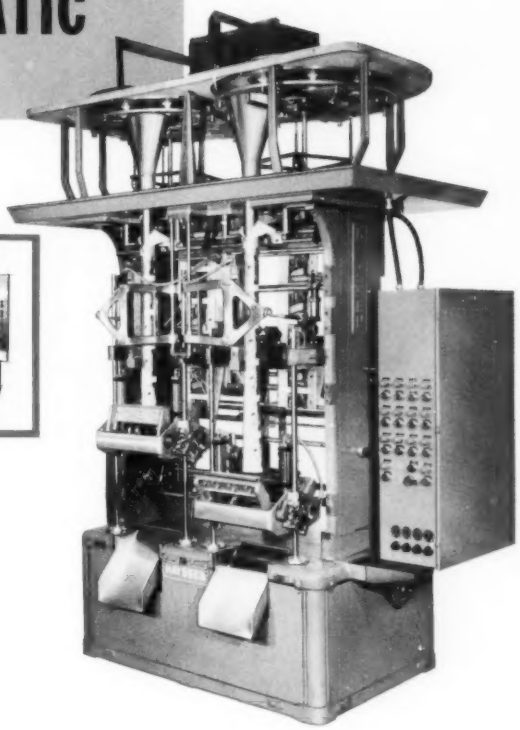
HAYSSEN

EXPAND-O-MATIC

COMPAK

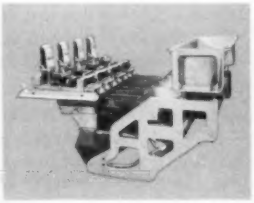
AUTOMATIC
VERTICAL BAG
FORMING, FILLING
AND SEALING





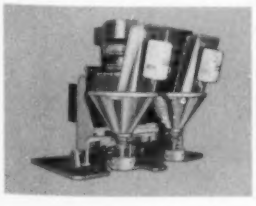
This new machine — with a double tube production of up to 200 bags per minute — packages an extremely wide variety of products in all types of heat sealable papers, films and foils. Single tube version — with a production rate of up to 100 bags per minute — is furnished with main frame and drive mechanism equipped for double tube operation. Production rate of single tube machine can be quickly, easily and economically doubled by adding a second tube — at ⅓ the cost of the basic machine.

HIGH SPEED, MACHINE MOUNTED FEEDS FOR **EXPAND-O-MATIC COMPAK***

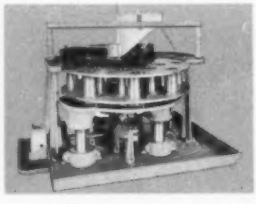


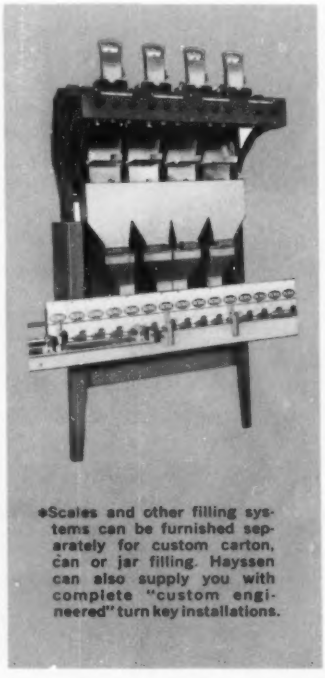
SCALE FEED handles an almost unlimited variety of free-flowing solid products. Available in various combinations of multiple heads, single and double bucket operation and dribble and bulk feeds.

AUGER FEED design for non free-flowing products combines extremely accurate measurement and high operating speed with unusual simplicity of adjustment.



VOLUMETRIC FEED design provides high speed operation, exceptionally accurate measurement and simple, quick size adjustment.

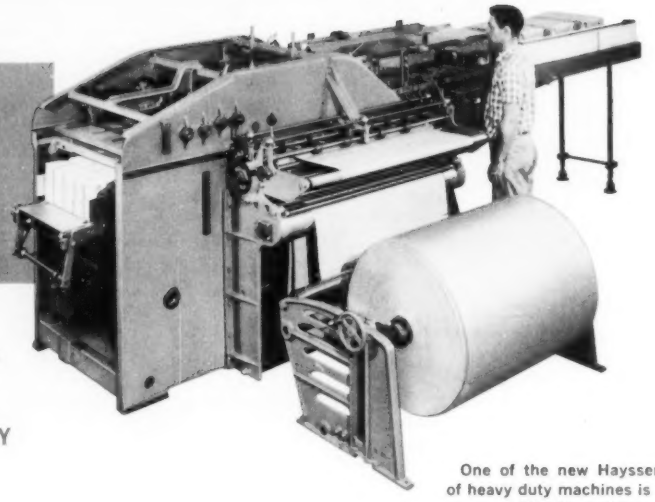




*Scales and other filling systems can be furnished separately for custom carton, can or jar filling. Hayssen can also supply you with complete "custom engineered" turn key installations.

LARD
LINGERIE
MACARONI
MAGAZINES
MALTED MILK
MARBLES
MARSHMALLOWS
MEAT
MEN'S AND BOYS' BRIEFS
MEN'S SHORTS
MEN'S AND BOYS' UNDERSHIRTS AND TEE SHIRTS
MINCEMEAT
MUFFINS
MUSTARD
NAPKINS
NECKTIES
NIGHT SHIRTS
NUT MEATS
NUTS
OLEOMARGARINE
PAJAMAS
PANTIES
PEANUT BUTTER
PHARMACEUTICALS
PILLOW CASES
PILLS AND TABLETS
PLACE MATS
POLISHING CLOTHS
POPCORN
POWDERS
PRESERVES
PRETZELS
Q. F. VEGETABLES
REAM PAPER
RIBBON
RICE
SALAD DRESSING
SANITARY NAPKINS
SAUCE
SCARVES
SEEDS
SHEETS
SHIRTS
SHORTENING
SHRIMP
SLIPS
SOUP MIX
SOX
SPAGHETTI
SPECIALTIES
STATIONERY
SUGAR
SWEATERS
SWEET ROLLS
TABLE CLOTHS
TAPE
TAPIOCA
TEA
THREAD
TOILET TISSUE
TOWELS
TOYS
WASH CLOTHS
WATCH BANDS
YARN
YEAST

HAYSSEN
NEW LINE OF LARGE, HEAVY DUTY MACHINES

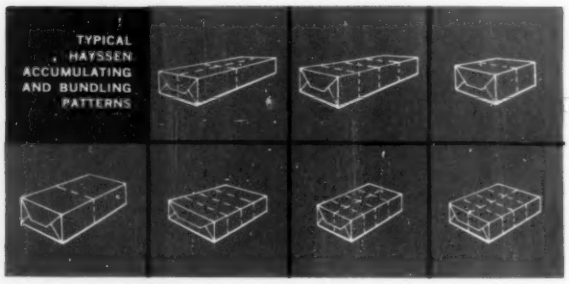


One of the new Hayssen "family" of heavy duty machines is this model JM with a shear size of 54".

FOR ACCUMULATING AND BUNDLING "WRAP-SHIPPING" AND STRAIGHT OVERWRAPPING OF LARGE, HEAVY PRODUCTS WITH HEAVY DUTY WRAPPING MATERIALS

Hayssen has designed a completely new "family" of large, heavy duty machines that economically handle most any size product. These new machines are specifically designed to utilize heavy duty wrapping materials up to 62 pt. linerboard (186 lb. kraft equivalent). Available accessories include a variety of accumulators, labelers, infeed conveyors, overall printers, spot coders, string or tear tape easy opening devices and scoring or perforating attachments.

HAYSSEN'S REVOLUTIONARY NEW LOW COST "WRAP-SHIP" PACKAGING REPLACES EXPENSIVE CORRUGATED SHIPPING CONTAINERS AND ELIMINATES COSTLY CASE PACKING OPERATIONS



Hayssen "WRAP-SHIP" accumulators and bundlers automatically gather any number of individual products into a neatly stacked arrangement and compression packages these products with strong protective materials of up to 62 pt. linerboard (186 lb. kraft equivalent).

With Hayssen "WRAP-SHIP" packaging, you save with:

- drastic reductions in packaging material costs.
- reduced inventory of packaging material.
- an absolute minimum of storage space for packaging materials.
- low floor space requirements for entire packaging operation.
- completely automatic operation which slashes labor costs.
- the elimination of tape and/or staples.
- the availability of a variety of easy opening devices.
- single overall color printing directly on the packaging machine.
- reduced shipping costs.

These and many other benefits make the concept of Hayssen "WRAP-SHIPPING" a tremendous cost breakthrough in protective packaging. Find out how much you can save — investigate Hayssen "WRAP-SHIPPING" techniques, today.

OVER 50 YEARS OF PACKAGING EXPERIENCE

Exclusively Manufacturers of Packaging Machinery Since 1910

HAYSSEN

MANUFACTURING COMPANY • SHEBOYGAN, WISCONSIN

Offices in principal cities. Check your phone directory.

ATLANTA • BOSTON • CHICAGO • COLUMBUS • DALLAS • DENVER • DETROIT • EVANSVILLE, IND. JACKSON, MISS. • KANSAS CITY • MINNEAPOLIS • NEW YORK • PHILADELPHIA • ST. LOUIS • SAN FRANCISCO • MONTREAL • TORONTO • VANCOUVER • OFFICES IN PRINCIPAL FOREIGN CITIES

Pouch packaging machines

In effect, a machine for pouch forming, filling and sealing is a complete packaging line—automatic, fast, compact and efficient. There are a number of different types of machines and each has been designed to produce a specific pouch construction. The machines have been developed, in general, for high-volume output and are widely used in packaging mass-distributed, low-cost products, such as peanuts, candies, produce, tea in tea bags, dried beans, pills, tablets, industrial parts; also such liquid products as hair-wave solution, French dressing, mustard and syrup in unit-of-use size.

Automatic packaging machines have been in use for many years, but in recent years new machines have been introduced and standard machines improved and made more versatile to meet the increasing demands of products employing flexible packages. This increasing demand has been spurred by the growth of self-service merchandising and the accompanying need for packages featuring function, visibility and convenience for the customer.[1]

The pouch is especially useful for samples in portions for trial use. It is increasingly important as a component package for cake mixes and other convenience foods. The pouch package is certain to be discovered by more and more industrial packagers and by marketers of hardware items. Recently machines, some of them employing a slant or horizontal feed, have been designed for handling larger, heavier products. Also, machines have been developed for packaging in pouches such soft, limp products as gloves and hosiery.

The pouch-style container, which can be formed from a very wide range of web stocks, including coated and laminated materials, abounds in functional characteristics and lends itself to visibility and convenience packaging. Since roll stocks are used, the problems of procuring, handling and feeding pre-formed containers are eliminated and the steps of filling, in-line transfer and closing—usually handled by separate line installations—are performed on a single machine. Labeling, too, usually is taken in stride, because the automatic packagers are designed to register automatically preprinted web stocks. In some cases, however, a random design which does not require registration is used.

Numerous attachments are available to help make the packaging operation efficient and the package more functional. Attachments can be employed to apply tear tapes during packaging, perforate the pouch or notch one edge for easy opening. One attachment, for example, applies a paperboard collar or saddle label.

Tea bags have a string and tag attached during forming operations. Some strips of pills or tablets packaged in imprinted transparent film are mounted in match folders or on cards. In some instances the primary container is cartoned automatically by an attached machine.

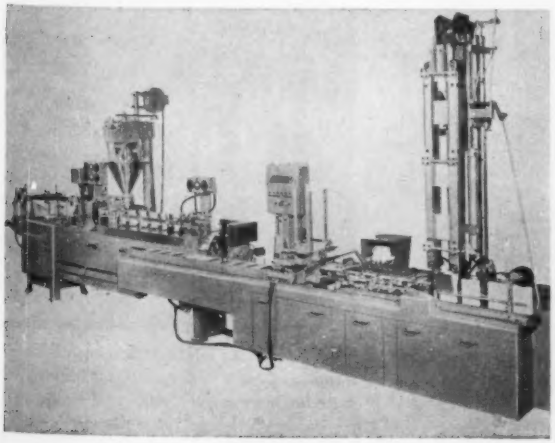
Not only is automatic pouch packaging basically a compact and efficient operation but, as discussed elsewhere in this book (see page 243), the merchandising features of these versatile, handy, lightweight, economical packages are in step with some of the most successful trends in marketing.

Just as there are many different styles and sizes of pouch packages, so, too, there are a number of different machines, makes and models.

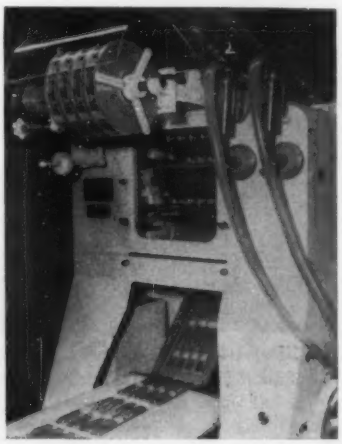
Automatic pouch- or packet-packaging machines share one important characteristic—they operate with web stocks and can be equipped with feeding devices to handle practically any type of product in single or multiple units. Some models are designed so that they can handle a range of products or sizes, but in general this range is limited since the basic advantages are fulfilled only with long runs.

The size of packets that can be formed ranges from a tiny individual packet, holding a single pill, up to any size pouch considered practical for this type of packaging. Pouches holding as much as 5 lbs. can be made, but in general the content is a pound or less. Obviously, there is no universal model handling all sizes. In-

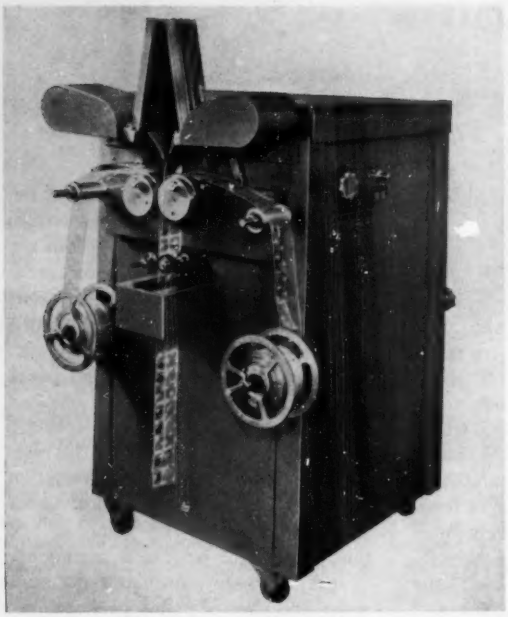
1 See "New Progress in Pouching," MODERN PACKAGING, Oct., 1960, p. 118; "The Continuous Pouch Packager," MODERN PACKAGING, April, 1960, p. 104.



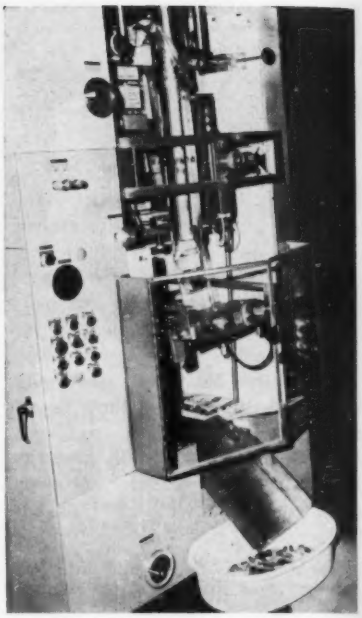
HIGH-SPEED unit forms, fills and seals pouches; inserts them into a carton—at the rate of one, two or three at a time. *(Bartelt Engineering Co. photo)*



FLAVORED ICE packager. Forms pouches of 2-mil extrusion coating of polyethylene on 300-gauge moistureproof cellophane, fills with liquid, seals four at a time, then packs them into cartons for freezing. *(Bell Machine photo)*



STRIP-PACKAGING machine handles pills, capsules, small hardware items, other small products (liquid or solid). Film, foil, paper, laminates or any sealable material can be used. Capable of double registration, counting, automatic cut-off, signalling of product omission. *(Mercury Heat Sealing Equipment photo)*



FEATURES of this pouch former include: push button controls; maintenance ease due to watertight and dust-tight mechanisms; plug-in and seal assembly for fast film changes; paper feed to avoid material stretch and to allow a faster drawbar action. *(Packaging Machinery photo)*

stead, there is a range of makes and models for each operation.

Pouch styles include those formed from a single web and from two webs. The single web produces a closed packet requiring a three-edge seal. For example, the well-known pillow-type pouch, made from a single web, is formed into a tube with a vertical seam up the back. The tube is heat sealed at top and bottom, producing a pillow-shaped package with two flattened ends. A second method folds the single web and seals the remaining U-shaped three sides.

Another type made from a single web is formed with a gusseted bottom. In one adaptation, the gusseted bottom permitted the packet to stand.

Pouches formed from two webs have all running edges heat sealed.

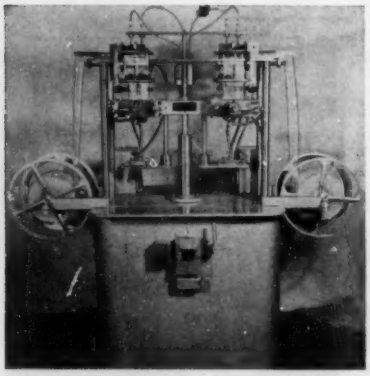
An interesting variation on the pouch package is the duplex or two-compartment pouch that packages popcorn in one compartment and vegetable oil in the other. The compartments are formed by a vertical heat seal up the middle.

Pouch packaging lends itself not only to component or combination packaging but also to multiple, fractional and strip packaging.

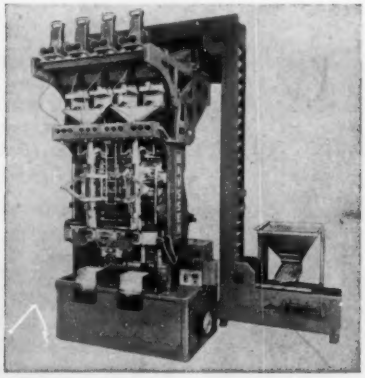
Pills and tablets, for example, make effective use of strip packages, which are produced on automatic equipment at very high output rates. In general, these machines seal each pill or tablet in an individual pocket. However,



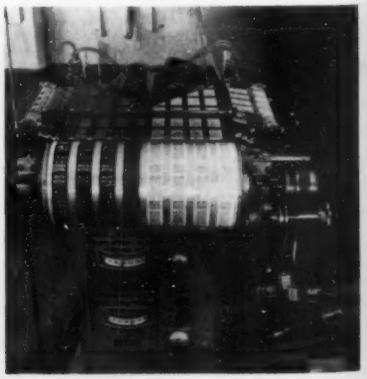
POTATO CHIPS and other fragile products are packaged by this pouch former, filler and sealer at rates up to 50 per minute. *(Wright Machinery photo)*



LIQUID PACKAGING unit features high-speed, multiple-pocket filling. Machine is air operated and has matched sealing dies. *(Brown Bag Filling Machine photo)*

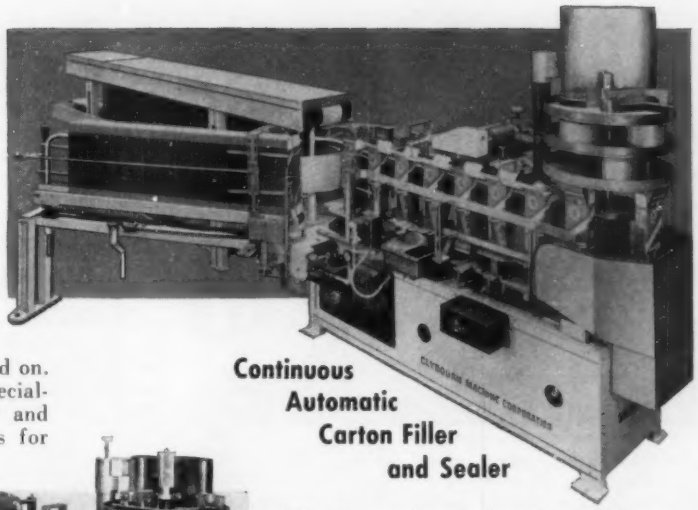


EFFICIENCY stems from all-mechanical counterbalance construction of unit. Auger, volumetric and pump feeds are available. *(Hayssen Mfg. Co. photo)*



SAMPLE- OR UNIT-packaging. Pouches formed, filled, sealed up to 10,000 units per hour for large-scale producer of drugs, cosmetics, other items. *(Bell Machine photo)*

Clybourn
Automatic
Cartoning Machines



Automatic Cartoning Machines you can depend on. Developed and perfected through years of specialization to provide the utmost dependability and economy on the wide range of applications for which they are recommended.

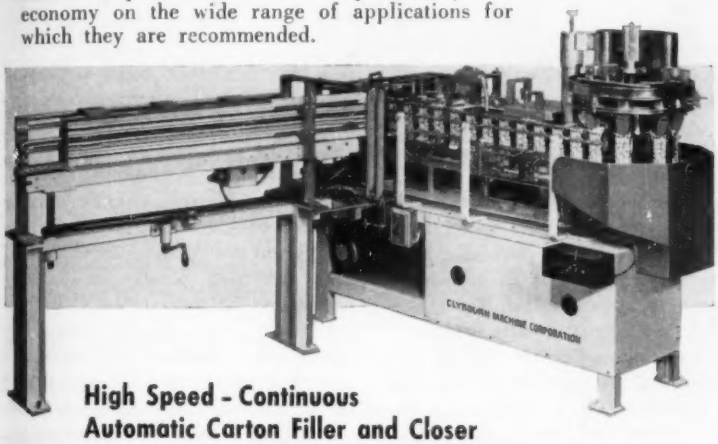
Continuous Automatic Carton Filler and Sealer

Effect tremendous savings in packaging—

- *granular products; rice, whole spices, pet foods.*
- *powders, bagged products, macaroni.*
- *manually fed solid objects and long goods.*

Speed easily adjustable from 30 to 150 cartons per minute. Three-dimension carton size change in less than 30 minutes.

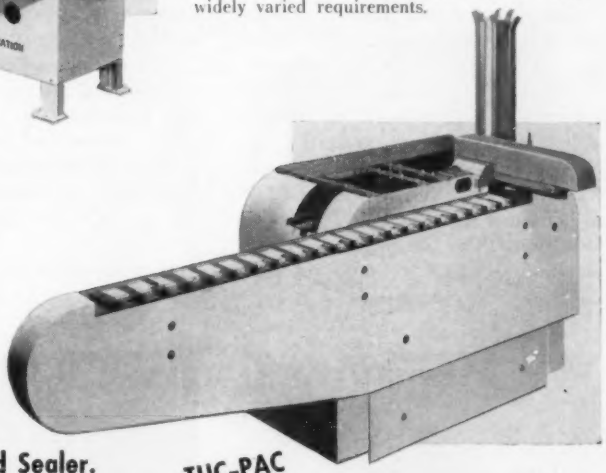
Five standard models, special models and a wide selection of optional features to meet widely varied requirements.



High Speed - Continuous Automatic Carton Filler and Closer

For high speed cartoning of candies, chocolate coated nuts, raisins, shelled nuts, roasted nuts, cough drops and tablets; also soap, detergent and bleach powders, etc.

Outstanding Features: • 200 cartons per minute. • Positive filling, no bridging. • Special, high speed carton opening mechanism. • Carton sizes, up to 2½x3¼x5 inches. • Uses only 6x8 feet floor space.



TUC-PAC Loading and Cartoning Machine

For bagged or solid products. Attendants load contents for one carton into each conveyor pocket. The TUC-PAC automatically forms and loads the carton, tucks the flaps and delivers a fully closed carton.

Furnished for straight, reverse or glue-end cartons.



Net Weighing Automatic Carton Filler and Sealer.

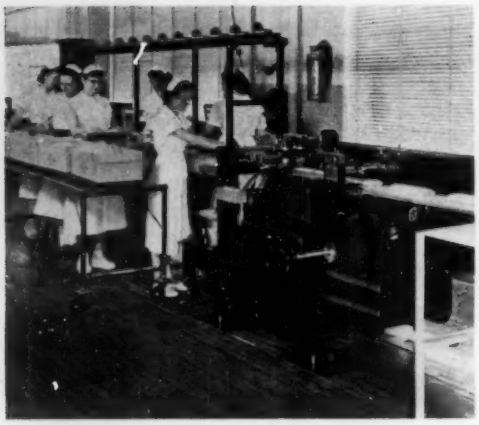
The latest Clybourn CMC Carton Filling and Sealing Machine with four net weighing scales. Automatically cartons every type of free-flowing product not suitable for volumetric filling. *Also available with two scales and for volumetric or auger filling.*

Clybourn know how is at your command in determining the machines and features most advantageous for your cartoning requirements.

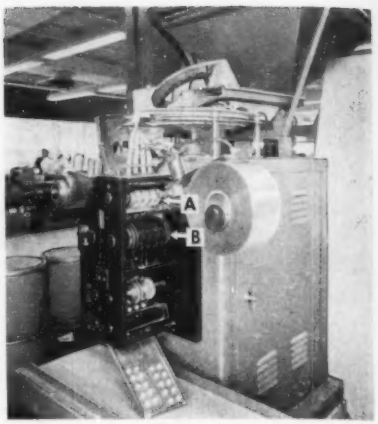
Just write or phone your requirements or send for literature. (Phone NEwcastle 1-8000)

CMC

CLYBOURN MACHINE CORPORATION
6479 N. Avondale Ave., Chicago 31, Ill.



FRAGILE spaghetti and macaroni packaged by standard horizontal pouch former adapted to items. Paddles descend, push product through trough conveyor to film-forming and sealing section. (*Photo, Hudson-Sharp Plant, FMC Corp.*)



TABLETS strip packaged in rotary unit. Vertical coiled springs keep tablets in horizontal position for feed roll (A). Rotated 90 deg., tablets drop on edge to nip rolls (B) that heat seal tablets in cellophane. (*Roto Wrap photo*)

practically any desired pattern or arrangement can be specified.

Products handled on automatic pouch-packaging machines include liquids, semiliquids, powders, granules, tablets, hardware and soft goods. Feed mechanisms consequently include volumetric, scale, augers, liquid fillers, pocket delivery and count.

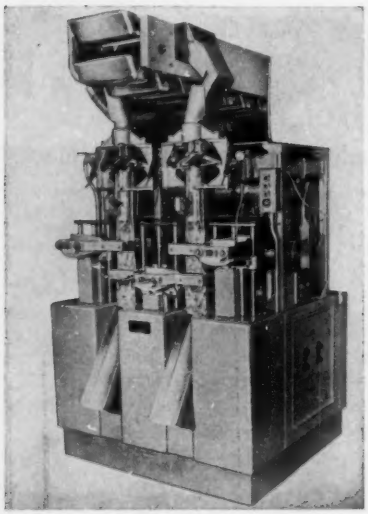
The chemical and physical properties of the product determine the best type of material for it. Most flexible heat-sealing materials are handled successfully on automatic pouch-packaging equipment—especially paper, cellophane, foil laminations and those plastic films that have a degree of body and stiffness similar to paper. With some films, including polyethylene and saran, there are problems, but these are rapidly being solved by machine adaptations. Also, polypropylene and some of the newer high-density grades of polyethylene have greater stiffness.

Engineering progress is continually providing refinements in speed and flexibility of automatic packaging machines, and emphasis is placed on the design of machine that can handle diversified products at greater speeds.

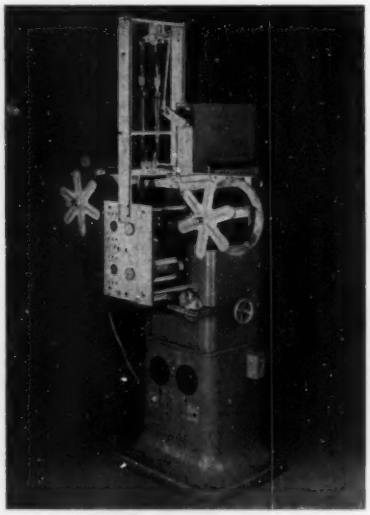
In selecting equipment, one of the packager's first questions should be "Do I have, or do I anticipate, sufficient volume to justify automatic packaging?" A second consideration is long-range operating savings which can be produced by different types of equipment.

It is important for the packager to bear in mind that pouch-packaging equipment is essentially special-purpose machinery. In general, it is designed for a particular industry and frequently for an individual product. Many notable gains have been made in increasing the versatility and range of applications for them. Nevertheless, great care must be exercised in selecting equipment, especially if your product is not a type already successfully handled on standard equipment.

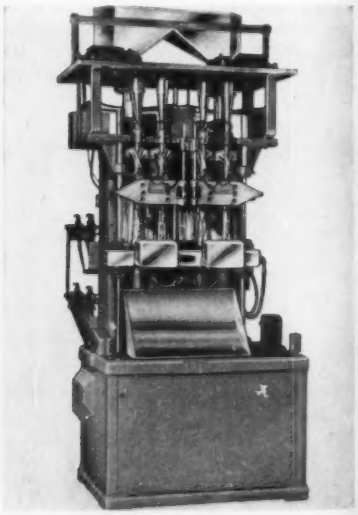
If your volume is small or seasonal, or if the packaging requirements are unusual, you might first consider the contract packager (see chart p. 47) who can help you develop your package and predetermine the practicality of installing some type of in-plant pouch-packaging equipment.



PILLOW-TYPE pouches are formed and filled by this machine which can handle an extensive range of flexible materials. (*Lynch Corp. photo*)

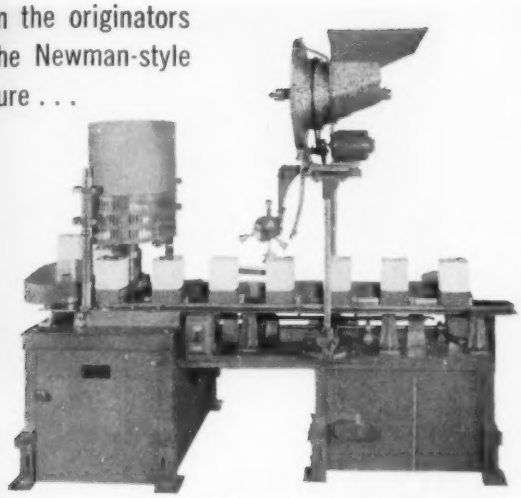


TWO WEBS are handled by this pouch-forming machine which is especially adapted for handling liquid products. (*Wrap-Ade Machine photo*)



EITHER FOUR-SEAL OR PILLOW pouches filled at 200 or more a min.; sizes up to 2⅝ by 6¾ in. (*Photo, Stokes & Smith Plant, FMC Corp.*)

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TB-4, single head, most suitable for larger size range at comparable production rate to the TB-2.

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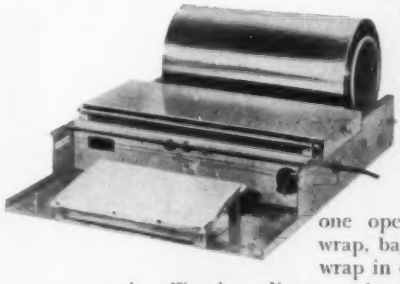
Just plug it in . . . wraps skin-tight packages with shrinkable film. Compact, easy to install. Complete with motorized conveyor, handles items up to 10½″ high, 14½″ wide, any length. Exact thermostat control. Custom models available.

AUTOMATIC POLY SEALER



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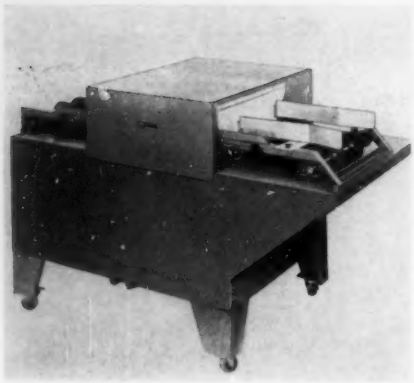


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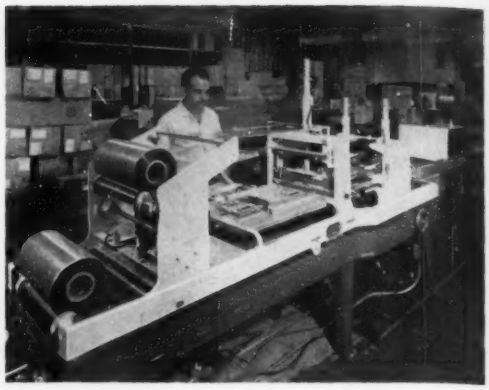
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PORTABLE shrink tunnel has heat capacity to 900 deg. F.; conveyor speed to 60 ft. per minute. Openings, 6 by 20 inches and larger. (*Weldotron photo*)



PERIMETER SEALER. Contour overwrapping unit has speeds to 2,000 packages per hour. Specially engineered for use with shrinkable film. (*Versapak photo*)

Packaging with shrinkable film

by Martin Siegel*

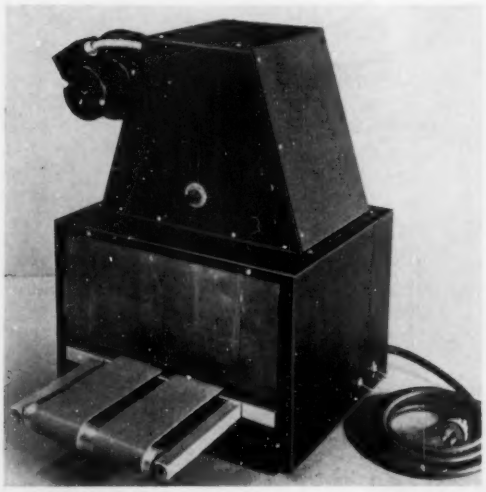
Packaging always has been a continuously changing picture, with new films, new machinery and new ideas constantly being introduced. A relatively new factor in the dynamic packaging field, and one that will in all probability play a key role in future package design, is the concept of shrink packaging.

Shrink packaging involves the use of a family of thermoplastic films that have a unique characteristic: they can be shrunk with hot air or hot water. This shrink feature of the films, coupled with the necessary equipment to handle them, has made it possible to produce skintight packages for a wide variety of products of different sizes and shapes and has made it possible to display-package effectively many items which heretofore were impractical for display wrap.

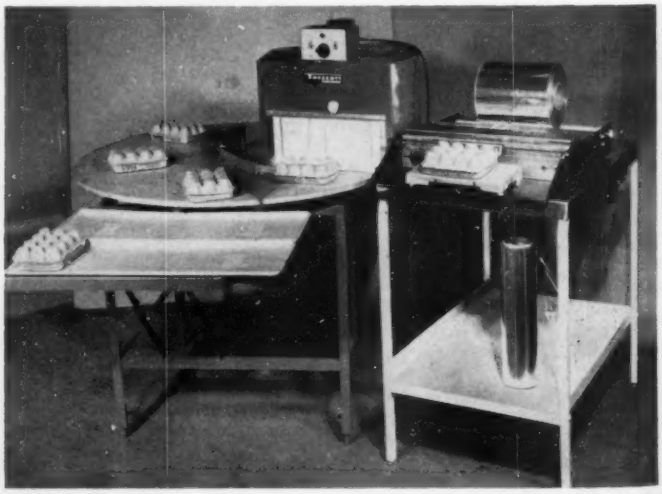
Shrink films have in common the fact that they have been stretched during manufacture in a process called orientation. Usually the stretch is biaxial or two-way: machine and cross direction. It is this two-way stretching that significantly modifies the physical properties of the films and imparts to them their unusual toughness and high initial tear resistance through increased tensile strength, their high gloss and sheen, and their all-important shrink capability which in some cases can be as much as 80%.

There is presently available a wide variety of shrink films. Additional types are in an advanced state of development and it can be expected that the selection of shrinkable films will widen at an accelerated rate. Biaxially oriented films are currently available in polyethylene, saran, polyvinyl chloride, polypropylene, polyester and polystyrene—either plain or printed. These films vary widely in properties. Some heat shrink more than others. Some do not heat seal or

*President, Weldotron Corp., Newark, N. J.



COMPACT shrink tunnel unit for supermarket use has thermostat for setting low or high temperature. Operates on AC current. (*Heat Sealing Equipment photo*)

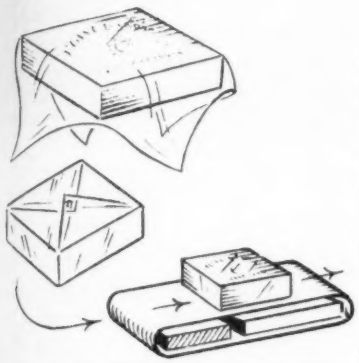


ROTARY CONVEYOR feature of shrink tunnel returns package to packer, eliminates conveyor belt. Handles over 600 packages per hour. Shrinks film at low temperatures. (*The Trescott Co. photo*)

Shrink packaging techniques*

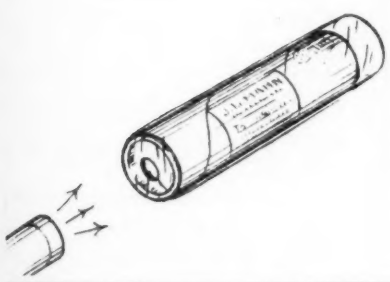
The methods shown here represent basic approaches to a new type of package in which the heat-shrinkable characteristics of a packaging film can be used to contain, fasten, immobilize and separate products as well as to perform a variety of other packaging jobs. In addition, these methods can provide new novelty and display advantages.

Shrink Wrap



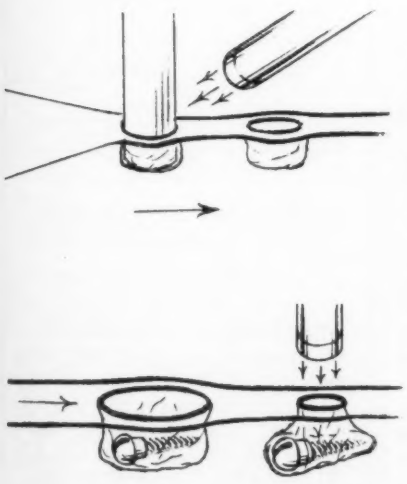
FILM is centered on product diagonal to product axes, and four film ends brought together on the product bottom. Package is passed, folds down, over a sealer-cooler. Some air passages remain between folds. Used on cut-up chicken in tray, franks, products in cartons, books, paper goods and odd-shaped items with flat side.

Shrink Tube



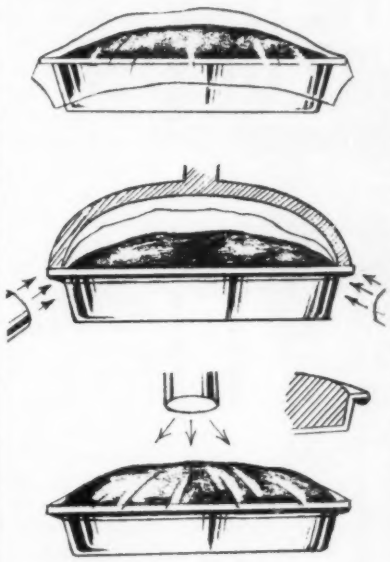
FOR TUBULAR or small rectangular objects. Product is rolled in sheet of shrink film with 1-in. overlap. Film should extend 1 to 2 in. beyond ends of product. Hot air is played on both ends of film to shrink them down over product ends. Also for groups of spherical objects.

Shrink Tape



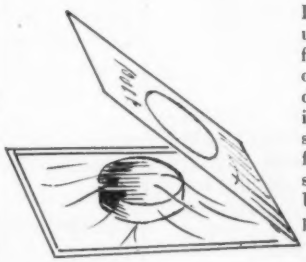
FOR IRREGULAR-shaped objects such as machine parts. Forms of desired shape are spaced along a film strip. Heat is applied from above, causing film to shrink up along sides of form. Form is then removed, leaving film pockets. Product is placed in film pockets and film is shrunk tight.

Shrink Cover



FOR TRAYS with flared-lip. Film is centered loosely over product with ends extending beyond container lip. Shield is placed over product so it rests over lip of container. Heat is applied at sides of container, shrinking film edges to a tight band under container lip. Then shield is removed and heat applied to top of product where film is shrunk to contour fit. For baked goods, fresh meats, metal parts, candy.

Shrink Display



FOR BUBBLE, window or stand-up display card. Product, with film placed over it, is put on back of card. Card front is brought down over product and film. Film is fastened to card with adhesives, heat sealing or mechanical fasteners. Heat is applied to shrink film to tighten package. Used for cosmetics and as anti-pilferage package.

Shrink Tie



SHRINKING FILM STRIP or tape is wrapped (can be loose) about articles to be tied. Tape is secured to itself by heat sealing, tying or mechanical fastener. Heat is applied to shrink the tape for tightly bound product. Method used for mounting odd-shaped items, immobilizing hinged handles or other loose parts, attaching premiums and for rack merchandising packages.

* The techniques shown here are reproduced from a booklet "Controlled Shrink Packaging," published by the Cryovac Div. of W. R. Grace & Co. The booklet presents a number of ways in which heat-shrinkable film can be used to produce packages. In addition to methods shown here, there are sleeve, lock, hammock, jacket and ring type methods of producing packages.

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heat cut readily. They also vary widely in strength, durability, barrier properties and cost.

Shrinkable films in the form of saran-type shrinking bags have been used for some time for packaging meat and poultry. With the advent of the new and diversified line of shrink films, and with the introduction of equipment to handle these films effectively, the applications of the shrink-packaging process have been enlarged and are growing. They include a long list of food products in the meat, poultry, dairy and produce fields and an impressive list of industrial and consumer products such as books, textiles, office supplies, record jackets and household products.

Manual, semi-automatic and automatic wrapping machines are used for handling shrinkable films. There are handwrappers using special film dispensers, sealers, sealer-coolers and trim sealers. There are semi-automatic and automatic overwrap machines modified for use with shrink films; and a number of special units such as shrink lid and sleeve wrap machines. Available also are devices for effecting the actual shrink. These include hand-held heat guns, heat generators and conveyorized shrink tunnels.

Perhaps the simplest and most common piece of wrapping equipment in use with shrink films is the film dispenser. Equipment of this type is generally suitable for use at the supermarket or at the terminal packer level.

A machine that is becoming increasingly important—because of its flexibility in wrapping a wide variety of products of varying dimensions without equipment change-over—is the trim-seal or right-angle sealer. This type of sealer employs right-angle sealing bars and will produce a package from centerfold roll stock directly around the product. Sealing units of this type are available utilizing hot wires or thermal impulse. Two-web machines with curved sealing bars are also available and are designed to produce full-perimeter seals for round products such as pizza pies. Contour packaging machines of this type are less flexible since die changes are required when package diameters vary substantially.

Several other types of semi-automatic equipment are currently available. A new sleeve or band-wrap machine is designed primarily for versatility. This machine feeds two webs of film and seals and cuts behind

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Hudson Sharp "Campbell" Models 2W6, 2W8 and 2W10 Wrappers. With and without Electric Eyes. Straight and Angle Infeeds.
Wrap King Models DW, DW-2, DW-4 and M2 Wrappers.
Scandia Model SFS-6F High Speed Automatic Wrappers.
Package Machinery Model CM3 Wrapper.
Package Machinery Model U6 Wrappers.
Battle Creek Models 40, 43, 46 and 48 Automatic Adjustable Wrappers.
Lynch Wrap-O-Matic Models RA and PB Wrappers. With and without Cardboard Roll Feeds and Electric Eyes.
Pak Rapid Model A Wrappers.
Miller Models MPS and MPUS Semi-Automatic Wrappers for cellophane, with Sheeters.

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each package (or tray) as it is fed through the machine. A unit used increasingly in the bakery and food-products industries is the film cover machine. It forms a tight lid over a tray in which the product is placed.

In summary, wrapping or lidding equipment in the manual and semi-automatic class will vary in price from $300 to $500 for basic angle-type sealing devices to several thousand dollars for the more sophisticated semi-automatic units.

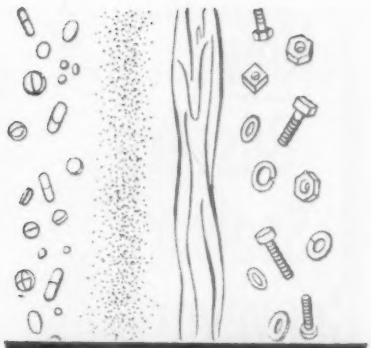
Although wrapping and tray-cover applications for shrink films have received major attention to date, there are other approaches that challenge investigation, including:

1. Strip packaging parts in a continuous band or tape.
2. Banding or tieing to immobilize parts of a product, such as a handle or hinged member, or to affix a premium to a product or package.
3. Profile card packs, combining die-cut, foldover cards and shrink-fit windows or jackets.
4. Suspension packs, or sling-type packages, wherein the product is placed between two layers of film or in a sleeve. The ends or edges of the pack then are fastened to the sides of a tray or other form such as a die-cut card. Shrinking of the film produces a tight suspension.

Shrinking the film

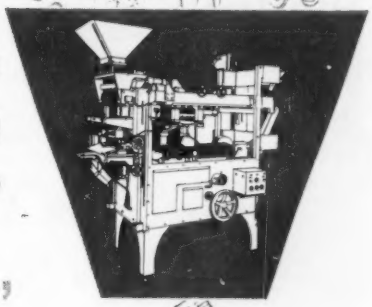
There are many types of heat-shrinking equipment in use. Hot water baths are employed effectively in poultry and meat shrink-packaging operations, but most products do not lend themselves to immersion. The need for an effective method to shrink package a wide variety of products has led to the development of hand gun heaters, heat generators and the hot-air shrink tunnel. Heat guns are generally motor driven to force air past a built-in heater bank and develop a continuous, high-velocity air stream. Heat generators are slightly more rugged adaptations of the hand gun. They may be hand held, or multiples of these units may be positioned for special shrink applications. They may be used also for spot shrinking of specific areas of a package. They prove very effective in sampling and designing new packages involving shrink films. The current price range of this type of equipment is from $35 to $50.

The equipment most widely used for production applications involving shrink films is the shrink tunnel. These



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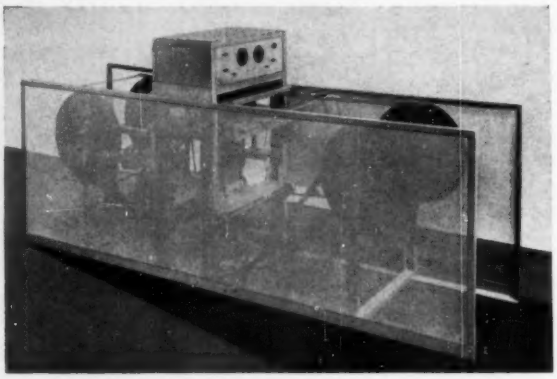


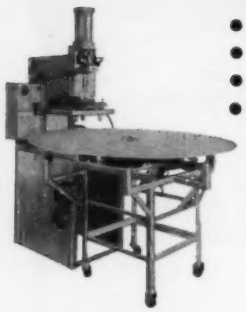
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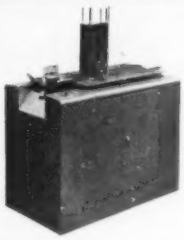
units are essentially box-like enclosures in which circulating hot air is generated and through which a conveyor carries the wrapped or trayed product that is being shrink packaged. Various types of heating systems, recirculating systems and conveyors are used. This equipment, of course, requires special design for maximum performance. It is most important to utilize a high-velocity, high-heat-capacity, hot-air recirculating system, with provisions made in the conveyor system to permit heated air to reach all surfaces of the wrapped products as they pass through the tunnel. This of course will produce the best results at the highest rate of speed. To assure uniformity of the packaged product and a high degree of reliability, it is important that good thermostatic control over tunnel temperature be maintained. Also important is the need for variable-speed drive systems to control conveyor speed.

The heating capacity of some tunnel models is approximately 3,000 watts and varies for other models up to 8,000 watts. Tunnel conveyor speeds vary from a maximum of 10 feet a minute on some models to 90 feet a minute maximum on others.

Of special importance in the choice of shrink tunnel equipment is consideration of the range of shrink films that may be used. Some shrink films are handled exceedingly well at approximately 250 deg. F., but some of the newer shrink films require tunnel temperatures of approximately 350 deg. F. and higher. At these temperatures, it becomes increasingly important to maintain high conveyor speeds to afford maximum product protection. With tunnels of proper design, the most heat-sensitive commercial products may be shrink packaged successfully at the high temperature ranges with no harm to the product. Vital too, is the fact that several packaging lines can be handled by a single tunnel. The price range of commercial tunnel equipment varies from $600 to $1,500 depending on the size and construction.

With the equipment now available, and the range of films being offered, a successful shrink-packaging operation can be achieved. However, thought must be given to equipment choice and to the overwrap film for a specific packaging application to avoid misapplication.

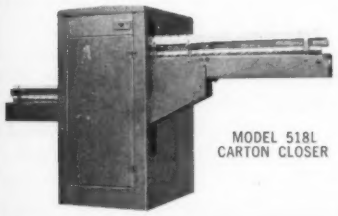
It is assumed the film chosen will have been checked for:



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TUCK-O-MAT



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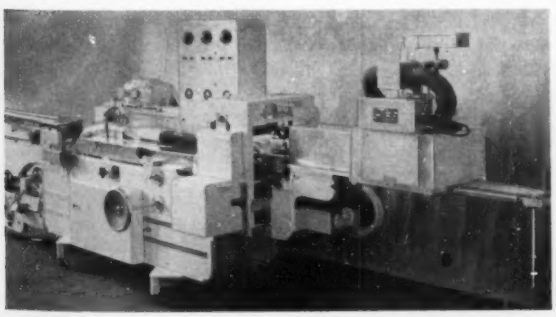
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4. Gauge of film needed and comparison with other films on a cost-for-performance basis
5. Heat-sealing and cut-off characteristics and requirements
6. Amount of shrink that film affords.

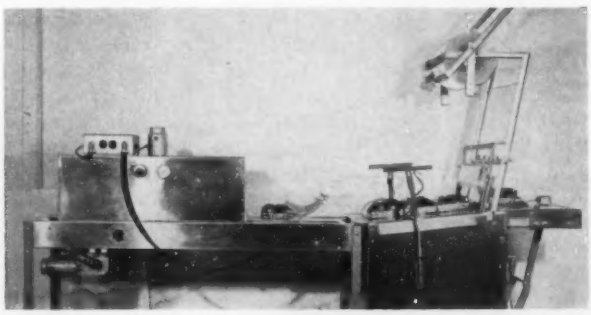
The handling of properly chosen shrink films, with respect to heating and timing in sealing operations, is not generally critical provided of course that sufficient heat to soften the film and sufficient pressure to effect intimate contact between the surfaces to be sealed is obtained. Owing to the nature of shrink films, impulse sealing techniques have generally proved very effective. In general, the actual shrinking of the film is not a critical operation. Once shrink equipment is set up so that temperature and conveyor speed are adjusted properly with respect to each other, uniform results can be achieved.

With an increase in the variety of products that will be handled by shrink films, special consideration will be required by the package designers to achieve best results. Problems will surely occur requiring modifications in tray and carton design. Where the package designer has coordinated his design as a result of having shrink-film characteristics in mind, exceedingly fine packages have resulted. Actually, shrink packaging can and should open up a new dimension in packaging concepts.

In the months ahead a great deal of development work will be done by equipment and film manufacturers.



HIGH-SPEED unit overwraps produce, meats, irregularly-shaped items with heat-shrinkable film. Also for bundling. (*Wrapper, Hudson-Sharp, FMC Corp.; tunnel, Great Lakes Stamp & Mfg.*)



AUTOMATIC SHRINK PACKAGER wraps, seals and delivers units of produce, meat or dairy items at rate of 24 per minute. Tray sizes 4 by 4 by ½ in. min. to 9 by 15 by 6 in. max. (*Formatron photo*)

Case loaders, gluers, sealers

by Kaye Holstebro*

To advance the objectives of production executives today, case loaders, gluers and sealers must do two basic things: (1) handle the newer, less expensive types of cases smoothly and efficiently and (2) operate efficiently at higher speeds.

The first requirement—newer types of cases—arises out of the necessity to reduce where possible the cost of shipping cases. So the trend has been to package in cases using less board.

As for the second requirement—higher speed operation—the need here is to beat the rising cost of labor by putting through more units per hour with the same operating personnel. Expressing it another way, production management looks to upgraded case loaders, gluers and sealers to help in the campaign to improve productivity.

In addition to the pressure of production economy, packagers of food and other consumer products must also heed the demands imposed by changes in merchandising methods. One well-known requirement that has had a big effect on case usage is the request by stores that shipping cases simplify handling and price-stamping of products or packages that are inside.

The initial response to this demand brought about the use of single-tiered cases on the part of a sizable number of consumer-product manufacturers. Supermarkets welcomed this change in casing, since single-tiering made price marking and removal of case contents easier with less chance of package or product damage.

Single-tiered cases, however, sharply increased the product manufacturer's case cost. In addition, at least double the number of cases had to be put through case loading, gluing and sealing equipment. Some money was saved by going to end-opening cases, which used less board than existing types of top-opening cases, but end-opening cases must be slit on three sides to expose the contents for price marking. Tearing tapes solved the problem of making the end-opening case easier to handle, but increased case cost.

Very recently, corrugated case manufacturers introduced a top-opening case with a wider gap between the top flaps. The saving in board reduced the cost of top-opening cases. The result is that product manufacturers are able to offer the convenience of single-tiered, top-opening cases at a satisfactory case cost.

Traying has gained some ground as a means of reducing still further the amount of paperboard used for shipping cases. The complete elimination of flaps in this form of casing is ideal for the retailer; contents of the case are out in the open, instantly available for price marking and removal.

To date, trays have enjoyed greatest success in breweries with high volume, localized brewing and distribution facilities. These companies can buy empty cans in bulk, palletized in such a way as to be fed automatically into the packaging line. In addition, they ship only for short distances, practically eliminating the problem of package damage.

Generally speaking, machinery suppliers have kept pace with the changing requirements of their customers. The era of case loading at the rate of 30 cases a minute is here. Even higher rates are attainable, depending on the size, shape and weight of the container. The integrated line—in which case opening, loading, gluing and sealing unite in automated sequence—is a proven cost-reducing method.

Perhaps one of the most interesting recent developments in case loading is the advent of the plastic bottle as a high-volume package for such products as detergents and bleaches. As yet, line speeds are relatively slow, but rates are climbing quite rapidly and the moment is not too distant when automated methods will be high priority "musts." On some lines that point has been reached.

The tasks created by the plastic bottle are unusual if not unique. This light container, with its resilient walls, is much more difficult to control than glass bottles, metal cans and paperboard cartons. Control of plastic-container movement is further complicated by the fact these colorful bottles come in an almost infinite variety of shapes.

Existing types of case loaders can be modified to handle, at reasonable speeds, those plastic containers with symmetrical cylindrical walls. Under development are new types that will be designed specifically to cope with the new and unusual conditions imposed by this package form. As far as case gluing and sealing are concerned, present types of equipment have proved eminently satisfactory, since plastic bottles offer no problems once they are cased.

Case loaders and packers

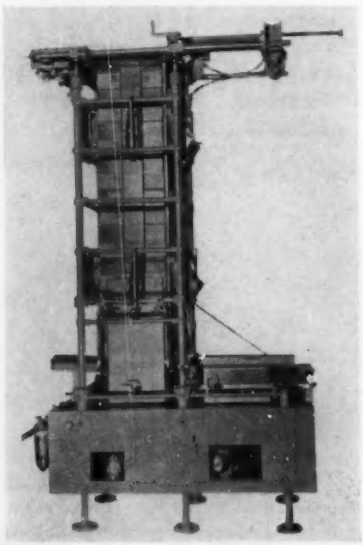
All case loaders—or case packers—have two main functions: collecting and forming the pattern of the load and placing the formed load in the case.

Patterns are formed in different ways. Bottles are generally handled in an upright position, oriented into desired patterns through lanes, and positioned for lowering into the case.

Cans may be similarly handled—large cans of motor oil are, in fact, so packed—or they may be rolled horizontally through dividers so that the pattern is formed to fit a case positioned on its side. The load is

* Portland Div., Emhart Manufacturing Co., Portland, Conn.

VERTICAL compression unit conserves space. It elevates cases to higher level for palletizing. Minimum discharge elevation is 8 ft.; maximum height, 18 ft. in increments of 2 feet. (*Emhart Mfg. Co. photo*)



then pushed horizontally into the case. When end-opening cases are used, the cans are pushed into this type of case in an upright position in order that the cans can be easily price marked at the supermarket—the cases are opened across the top rather than at the ends where the flaps are.

Speeds attainable with modern bottle packers range up to 30 cases per minute. Duplex units boost the rate up to 50 cases per minute. Can packers for bulk loading operate at speeds up to 25 cases per minute.

Case loaders for milk carton packers represent a specialized group of machines. They load the cartons into the cases vertically by means of grippers. The load pattern is formed by collecting cartons in an upright position and by mechanically pushing and timing the container into the required place. Operating speeds average up to 14 cases per minute.

Packages such as bags or cartons are fed into the collector or packer in a counted quantity, then raised a layer at a time until the load is complete and can be pushed horizontally into the waiting case or bale. A sheet metal form which coincides with the case's inside dimensions guides the load into the case. Generally called the loading funnel, it is necessary since a tight fit in the case is desired.

Case gluing and sealing

Of the four methods of preparing a case for shipment—gluing, stapling, taping and strapping—gluing is the predominant and most economical technique. The other three methods follow in the order indicated as far as sheer volume is concerned. (Stapling equipment is described separately, see page 552.)

Taping is a well-known method and is used in the small as well as the largest of shipping rooms. Automatic equipment has been in use now for some years and has a proven record of cost reduction in high-volume taping operations. Strapping is obviously the most secure of all methods of preparing a case for shipment. Its uses are well defined. Automatic equipment has assisted greatly in speeding the rates of case handling.

Gluing merits close scrutiny now not alone because it is the method most widely used but also because important developments have been introduced and proved in the field this past year—while still others are pointing to possible future advances.

Two of the more recent innovations are the use of hot-melt adhesive and the application of glue by means of spraying. Both techniques offer the advantage of almost instantaneous sealing, but are still in the developmental stage. A third fast-sealing method under study is the use of dielectric sealing. With this method, moisture in the glue is almost instantly removed; but this system, too, is in the experimental stage.

In the specialty area, cases supplied with pressure-sensitive adhesive applied by the case manufacturer have gained ground. These cases are, as can be imagined, relatively expensive. They can be economical, however, for companies using a variety of case sizes in small quantities.

While the above methods of gluing are of interest for limited use today and possibly intensive use in the future, the advance that has brought practical benefits on a broad commercial basis is the pressure-fed, closed system of adhesive application. This new but already proved technique answers the demands of case users for a neater, more economical and faster way to glue cases securely and efficiently.

This system was first introduced in the form of a conversion kit. It is still available in that form now for use in modifying existing types of gluers. It is also available on a new unit designed expressly to take full advantage of the system's features.

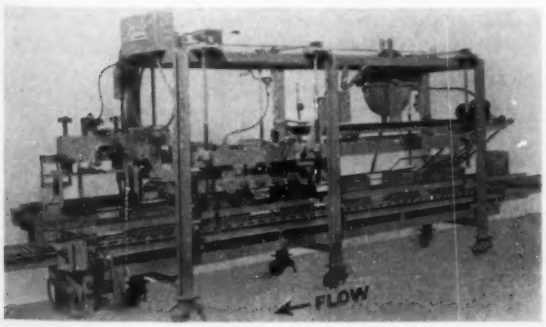


GLUE SEALER, shown in GE lamp plant, adjusts automatically to vari-sized containers fed in random order. Lowers packaging costs for diverse products in small lots. (*Textile Machine Works photo*)

This method does away with glue rollers and pots by utilizing a valve which applies glue under pressure directly to the case. The pressure system meters the adhesive in narrow strips, leading to glue savings both in application and by eliminating the wasteful cleaning of pots. The system also can reduce starting time and routine machine maintenance.

Gluing and sealing equipment follows a fairly uniform basic operation. Means are provided to time cases into the gluer and to open flaps, both top and bottom, or either, so that glue can be applied to the outer flaps. Glue usually is applied in a "skip-gap" pattern which hits the flaps only where they will contact the end flaps, thereby keeping glue off the case contents. After glue is applied, the flaps are plowed down against the case and the case is conveyed into the compression area. Here top and bottom belts, spring-loaded on top, press the flaps firmly against the case and hold them until the glue is dry. The speed of the line requirements dictates the length of the belt. Also, whether the compression unit runs intermittently or continually affects belt length.

Vertical sealers, or compression units, solve the problem of space. Equally important, they tie in with present methods of case palletizing. The need for an elevating device is eliminated. The vertical sealer lifts the case as it holds the flaps down to effect a bond.

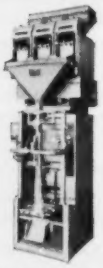


COMPACT case-sealing machine, 8½ by 3 by 7 ft. high, tape seals automatically the top and bottom at rates up to 30 cases a minute. (*General Corrugated Machinery Co. photo*)

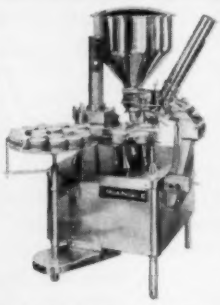
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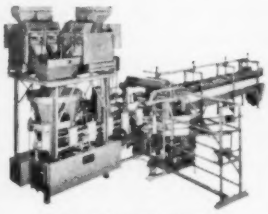
Triangle L-22 Twin Tube Automatic Bag Maker with two P-30 Traveling Trap Gate Volumetric Fillers. Will handle a full range of bag sizes up to 11"x16", with speeds up to 200 per minute.



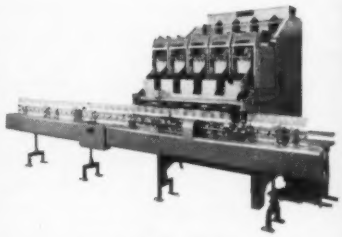
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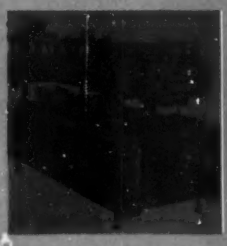
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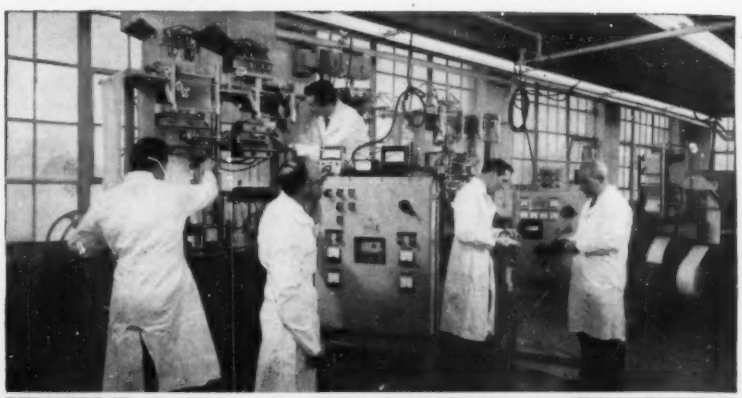
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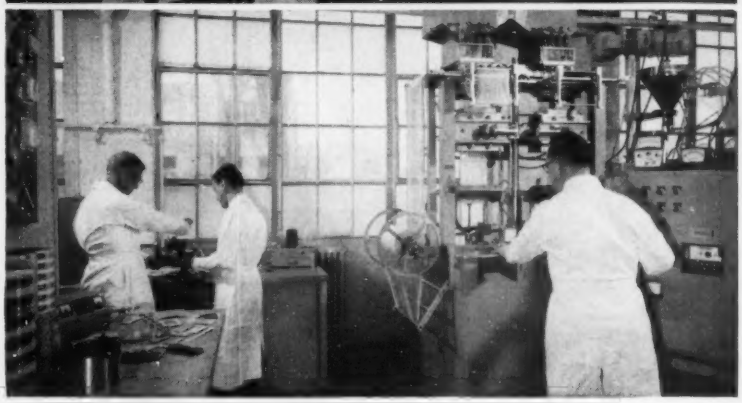
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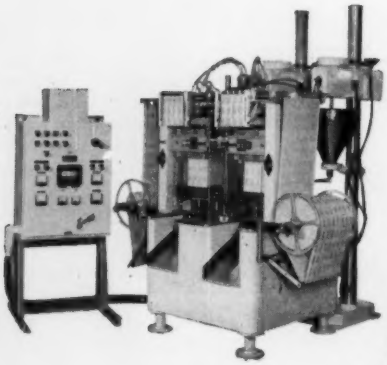






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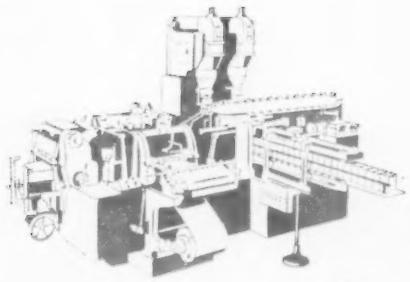
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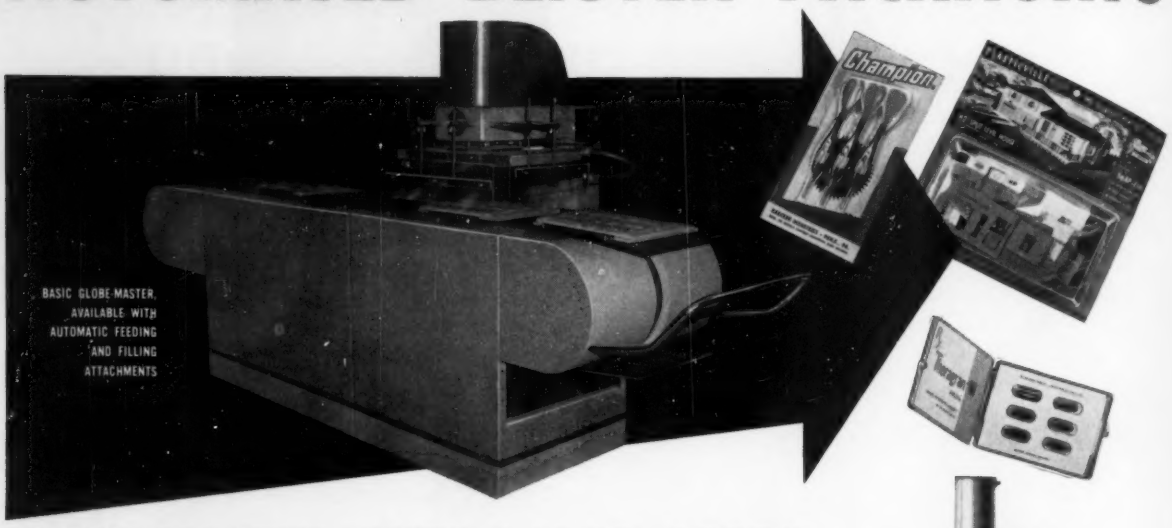
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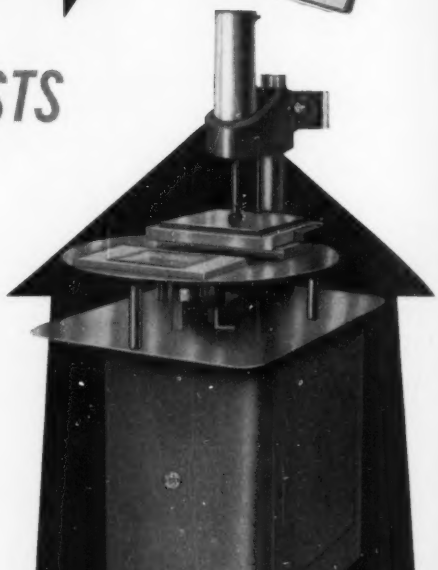
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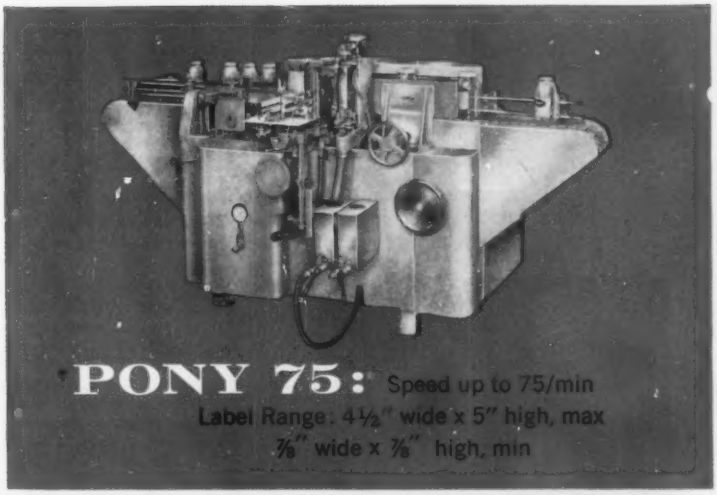
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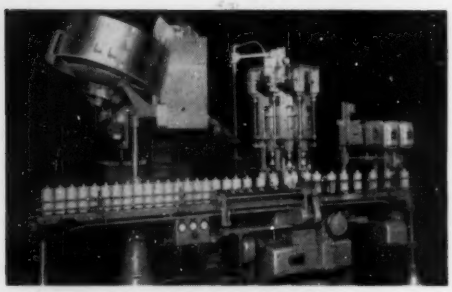
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Paper Box Machinery

NEW JERSEY MACHINE CORPORATION

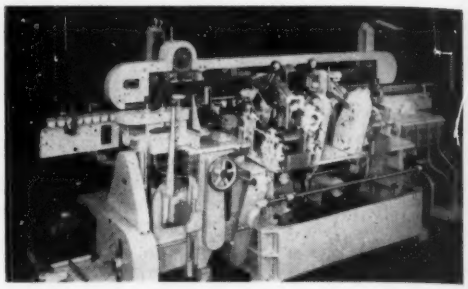
MAIN OFFICE AND PLANT • 16TH ST. AND WILLOW AVENUE, HOBOKEN, N. J. • OLDFIELD 9-0483
FACTORY SALES AND SERVICE BRANCHES: 325 W. HURON ST., CHICAGO 10, ILLINOIS, 2500 W. 6TH ST., LOS ANGELES 57, CALIFORNIA

PNEUMATIC
PACKAGING AND BOTTLING MACHINERY

Complete equipment for carton forming, lining, filling or weighing, top closing and tight wrapping.
Bottling machines for unscrambling, air cleaning, liquid or powder filling, capping and labeling.
Units sold for individual operations or as integrated production lines.



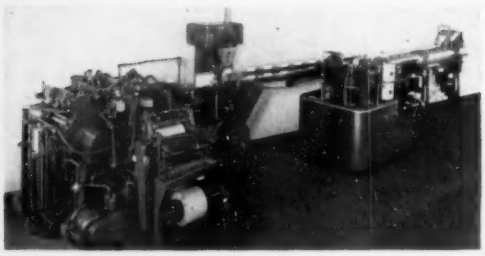
◀ **PNEUMACAP-8** — One of several rotary capping machines available for speeds up to 240 or more containers per minute. Made in 2, 4, 6, and 8 head units suitable for application of partial turn-on lug type to multi-turn continuous thread closures. It features Sterling Cap Feeders, air operated chucks, and the new Escalator Lift which allows cap loading at floor level.



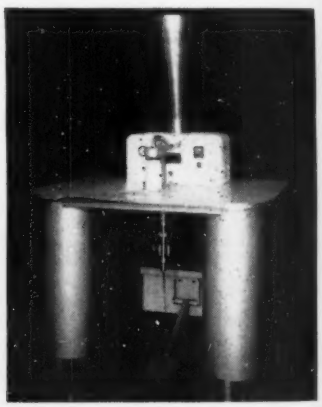
▲ **4" DUPLEX DIREC-TRANSFER LABELER** — Designed for precision label application. Label is transferred direct from stack to container. Applies both front and back labels at speeds ranging up to 120 per minute.



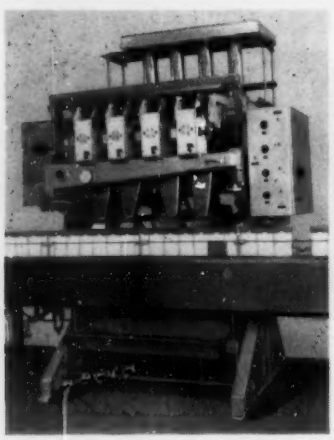
◀ **PLASTIC TUBE FILLER AND SEALER** — Model 60 is one of several models available. Pneumatic's Carbert Division offers equipment for every production requirement in plastic tube filling and sealing at speeds ranging to 120 per minute.

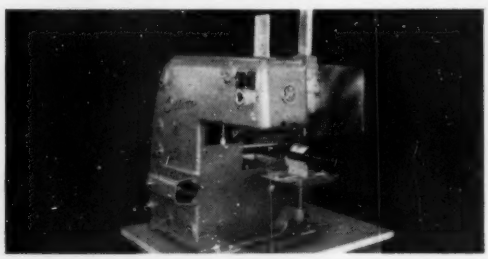


◀ **DOUBLE PACKAGE MAKER COMBINATION** — Made up of Small Package Maker, Volumetric Filler and Rotary Top Closure units. Produces finished package which offers maximum protection with space for complete fill.



▼ **COLLETTA UNIVERSAL LABELER** — highly flexible bench type labeling machine which offers substantial savings on short run operations. Easily converted to fully automatic unit with fitting of available infeed and delivery attachments.





◀ **4-HEAD PNEUMATRON WEIGHER** — The most practical approach to instantaneous pressure weighing. Pneumatron heads are made up of cantilever assemblies and air jet control devices which measure receptacle deflection in millionths of an inch while weighing within hundredths of an ounce. Available in two, four and six head models.

▲ **VACUFLOW JUNIOR POWDER FILLER** — the ideal semi-automatic machine for filling a wide range of powdered materials into rigid or non-rigid containers. Operator simply places container in position and depresses foot pedal to start automatic filling cycle. Offers dependable, versatile performance at low initial cost.

PNEUMATIC

Packaging and Bottling Equipment

PNEUMATIC SCALE CORPORATION, LIMITED

MAIN OFFICE AND FACTORY . . . QUINCY 71, MASSACHUSETTS, U. S. A.

Delamere & Williams Company, Ltd., Toronto, Ontario; Carbert Manufacturing Company Division, Quincy, Mass.

SALES OFFICES: New York • Chicago • Dallas • Rochester • Atlanta

WEST COAST: FRED TODT COMPANY, Los Angeles • San Francisco • Seattle

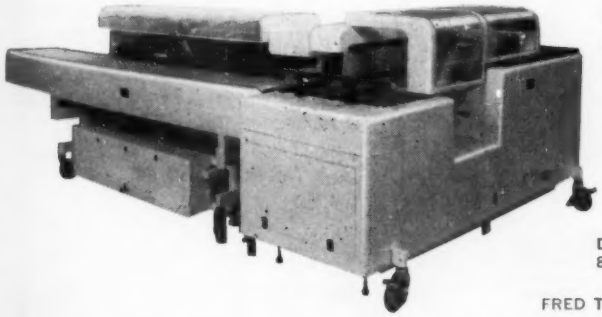
NEW CONCEPT IN FILM BAG PACKAGING



Here is the first fully automatic integrated system that offers top efficiency, lower costs, and extra sales appeal through plastic bag packaging operations. One operator tends the Carbert machine combination which turns out over 40 neatly contoured packages per minute.

As flexible as it is fast, the Loader-Sealer adapts to a broad range of products—bakery goods, textiles, garments, knit goods, magazines, to name a few—and a wide range of plastic bag sizes and shapes. With automatic loading, the result is uniform packages — all identical in size, seal and overall appearance.

Write for full details on how this modern equipment can improve your profit picture in film packaging.



CARBERT
MANUFACTURING CO.
DIVISION OF PNEUMATIC SCALE CORPORATION, LTD.
82 NEWPORT AVE., QUINCY, MASS.

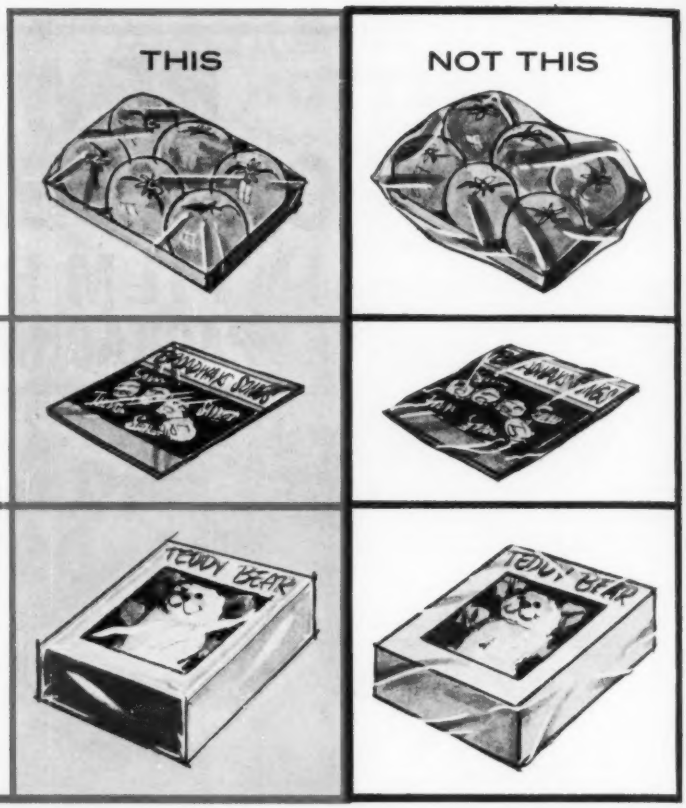
WEST COAST REPRESENTATIVE:
FRED TODT COMPANY Los Angeles – 2021 South Hill Street; San Francisco – 866 Burlway Road, Burlingame; Seattle – 105 South Orcas Street

FOR CRYSTAL-CLEAR,

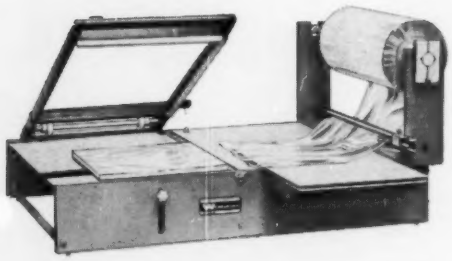
SKIN-TIGHT PACKAGING

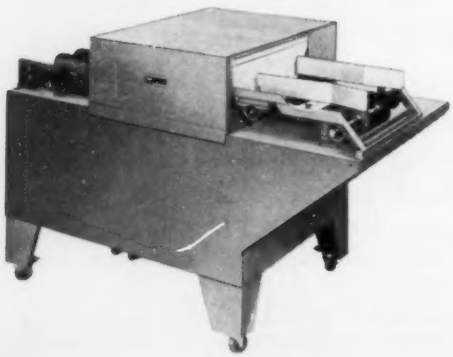
that keeps its

"JUST-ARRIVED" LOOK



WELDOTRON SHRINK PACKAGING EQUIPMENT





More and more manufacturers are turning to shrink packaging in order to produce skin-tight, crystal-clear contour packages for a wide variety of different size and shape products. A full range of shrink films is currently available to suit every packaging need – And Weldotron has developed a line of equipment to seal and shrink these films. It gives you packages that protect and show off your product, maintaining a "just arrived" appearance.

WELDOTRON L SEALERS

Our engineers have developed a full line of manual and semi-automatic thermal impulse sealers which, with each stroke, form a complete package from V-folded or single rolls of *shrinkable or regular films*. These Weldotron impulse sealers are the best type for use with shrinkable films because they heat and cool extremely fast, resulting in clean, strong seals.

WELDOTRON HEAT TUNNELS

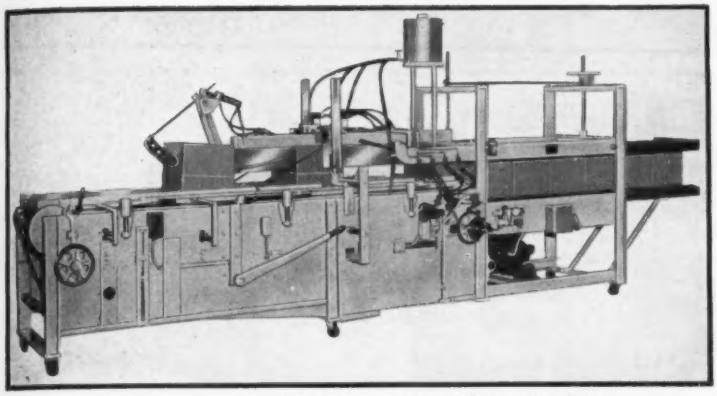
When a package, large or small, has been sealed, the Weldotron Heat Tunnel will shrink it to a perfect contour fit because its high velocity recirculating heated air reaches all surfaces evenly. There are thermostatic controls for setting and maintaining exact temperature. Featuring fast, economical, trouble-free operation, the Weldotron Heat Tunnel has variable conveyor speed up to 60 FPM. It has the highest speed available commercially and can be used for all shrinkable films.

For more information on Weldotron shrink packaging equipment, please write today outlining your requirements.

WELDOTRON *Corporation*
PACKAGING DIVISION

909-E Frelinghuysen Avenue, Newark 14, N. J.

More companies are choosing National Short Case Sealers because...



Leading users of National Short Case Sealers are Goodyear, Lever Bros., Schrafft's, General Electric, Borden Co., Philco and a host of others.

- No daily cleaning with totally enclosed patented glue applicators
- Shortest – saves floor space.
- Easily adjustable for widest range case sizes.
- Glue savings – up to 80% with patented glue valves.
- Labor saving – lowest maintenance.

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312–SEely 3-7845

No matter what your case sealing problem, the National Case Sealer can be suited to meet your every requirement . . . with a versatile, easily adjustable size range.

TELL US YOUR CASE SEALING REQUIREMENTS

WELDOTRON

The complete line of low-cost
PACKAGING EQUIPMENT
for hand, semi-automatic and automatic operations

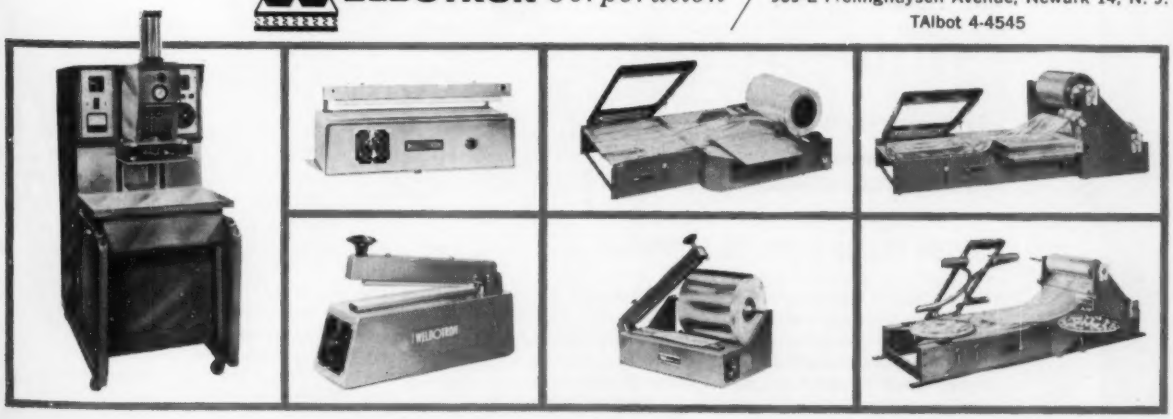
If you are presently using or planning the purchase of packaging machinery, it will pay you to learn more about our wide range of equipment. We manufacture a line of RF electronic sealers and thermal impulse sealers, including units to form and seal bags directly from rolls of shrink or regular films.

Other impulse sealers include a contour sealer which will produce a package to match the symmetrical shape of such products as pizza pie or heart shaped candy boxes. Also available is a machine especially designed to package tray-nested produce and bakery products.

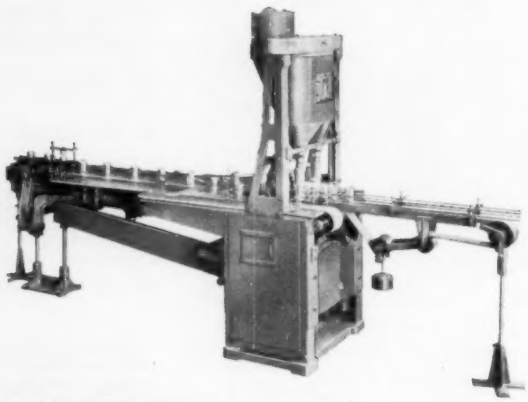
Latest development from our engineering department is a unit that combines both a sealing device and a mechanical cut off and is expressly designed to produce bags or packages of any desired length directly from tubular roll stock.

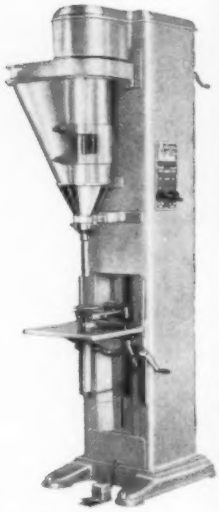
For the solution to **your** packaging problems, write today for more information — or ask to have a representative call.

WELDOTRON *Corporation* / 909-E Frelinghuysen Avenue, Newark 14, N. J.
TAlbot 4-4545



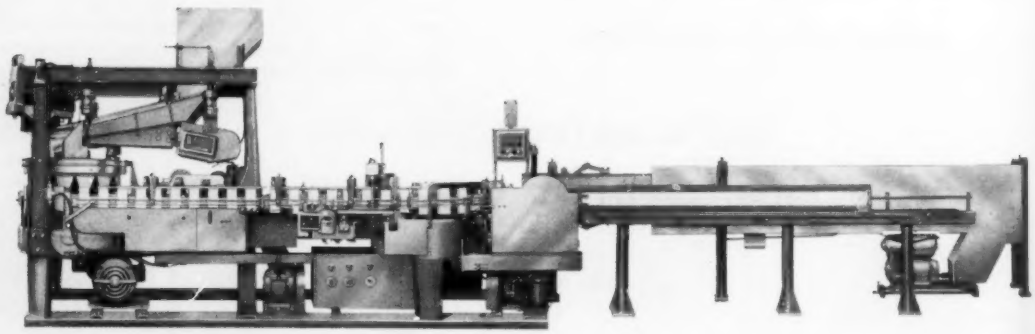
fmc ... the industry's most complete line of PACKAGING MACHINERY





AUTOMATIC AUGER FILLERS. The model shown fills cans, boxes, jars or cartons with powders, or granules, up to 70 units per minute. Adjustable from ½" to 8" high containers. Completely automatic auger feed with either gross weighing or volumetric filling to assure precise accuracy. Can be supplied with vacuum attachment for dustless pack-filling of powder products. Other automatic models available in one, two and four station designs with speeds up to 140 units per minute.

SEMI-AUTOMATIC AUGER FILLERS. This machine comes equipped with four filling methods (volumetric, pressure packing, gross weighing and combination auger-vacuum) to fill granules, powders and certain pastes. Handles a wide variety of container types—cans, cartons, jars, envelopes or bags, etc.—and weights from 2 gms. to 10 lbs. or more. Semi-automatic operation up to 30 units or more per minute. One operator. Extreme flexibility of control and precision of operation reduces filling costs to a minimum. Ideal for short runs, off-size containers. Many other models available to meet specific requirements.

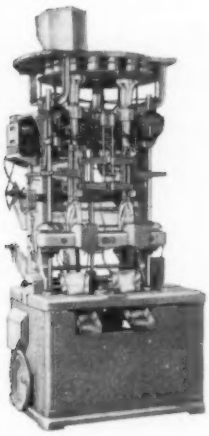


CARTON FILLING & SEALING EQUIPMENT. With volumetric fill mechanism the high-speed NEVERSTOP feeds and fills up to 300 pre-made, economical, single-wall cartons per minute with free-flowing products such as soap powders, cereals, chemicals and dried vegetables . . . forming and sealing both top and bottom in one continuous fully automatic operation. Auger filling available for non-free-flowing powders. Also available with vibrametric fill mechanism to form, fill and seal up to 450 cartons per minute with products of varying densities. In addition to cold glue sealing, models can also be equipped for hot melt adhesives, compartmented cartons, Van Buren ears, or the new Calk Seal to provide more siftproof and moisture resistant seals and eliminate the need for inner-liners or overwraps.

SIG* models for 60 to 250 per minute speeds available with choice of volumetric, net weighing and auger designs to accurately fill extensive variety of powder and granular products. Good adjustability for size changes.

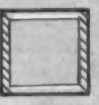
FMC Corporation's broad line of packaging machinery carries four distinguished trade names—Stokes and Smith, Hudson-Sharp, Simplex, and Kingsbury & Davis. All noted for leadership in machine design and manufacture within their respective fields. And together, under the FMC banner, they offer the most complete line of equipment offered to the packaging, paper mill, converting and paper box industries. The equipment shown here represents the major units of two plants —Stokes & Smith and Kingsbury and Davis. In most cases the machines illustrated are also available in a number of other designs.

Whatever your packaging needs, look to FMC first. Catalogs and detailed literature are available on all lines. And our Application Engineers are ready to study your requirements at no obligation. A sample of your product and container will help in making preliminary analyses and recommendations.



POUCH FORMING, FILLING & SEALING EQUIPMENT. The STOKESWRAP pouch machine forms, fills, heat seals and, if desired, codes packages of powders, granules, liquids, semi-liquids or pieces—in printed or unprinted film of almost any type taken from roll stock . . . all automatically. Models available to produce either pillow type, 4-seal or strip packages at speeds from 40 to 240 per minute and sizes up to 8" wide x 14½" long with choice of five feeding designs: volumetric, counting, net weighing, auger or liquid. Newest, most versatile STOKESWRAP "1000" is a double-tube machine with all the advantages of two single-tube machines, but at less cost. Either tandem operation or each tube operating independently with different products, films, sizes, feeds, etc.

SIG* horizontal models also available with piston or auger filling. Form, fill and close four-seal pouches automatically at speeds up to 150 per minute from roll stock of any heat sealing material. Front and back registration of printed web.





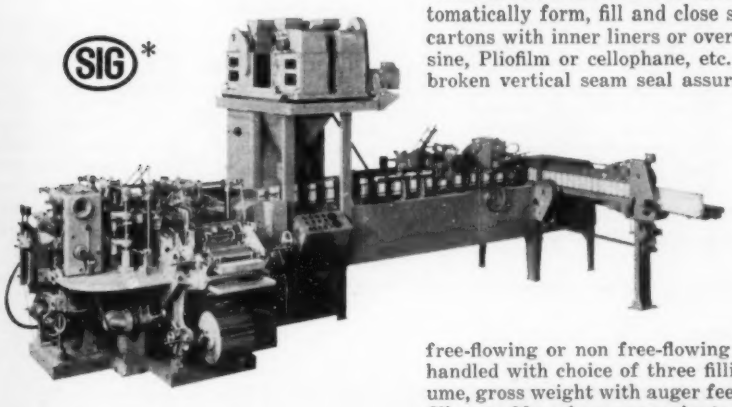


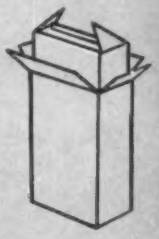
CONTOUR WRAPPING EQUIPMENT. STRETCHRAP wrapping machines provide snug, contour wrap for irregular shaped products including prepared meats, cheeses, balls of twine, toys, etc. with heat-sealed Pliofilm at a rate of 12 to 15 wraps per minute. One operator.

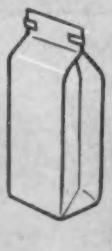




DOUBLE-PACKAGE MAKERS. SIG* Double Package Makers automatically form, fill and close single or double-wall bags, or cartons with inner liners or overwraps. Handle liners of glassine, Pliofilm or cellophane, etc. and printed overwraps. Unbroken vertical seam seal assures air-tight bag. Almost any free-flowing or non free-flowing powder or granular product handled with choice of three filling methods: net weight, volume, gross weight with auger feed. The carton-forming models fill up to 80 packages per minute in 1 oz. to 5 lb. sizes. The bag-forming models up to 90 per minute in 3 oz. to 5 lb. sizes depending upon density. Choice of any of the popular tin-tie, heat-sealed or glued closures . . . stand-up or flat types. Varying heights of fill caused by density variations easily compensated for in top folding. Bundlers and checkweighers also available.

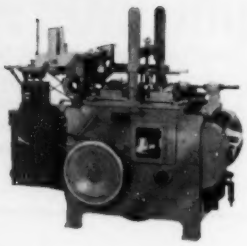






SIG is the trademark of Swiss Industrial Company, Switzerland . . . for over five decades a world leader in precision engineered packaging machines built with unsurpassed skill.

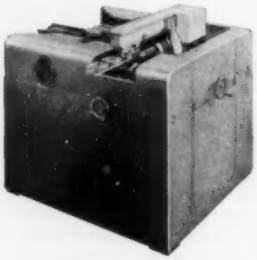
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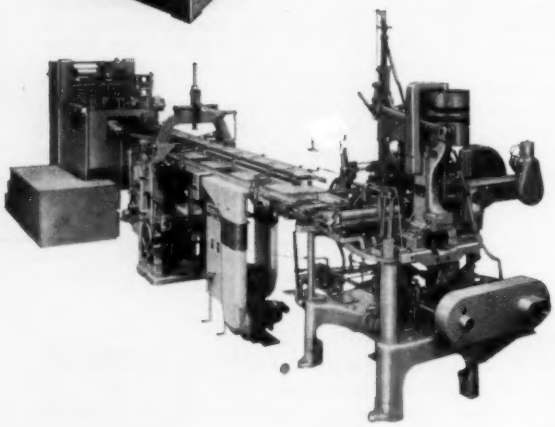
BOX & TRAY FORMING EQUIPMENT. POLY PAK (illustrated) makes low-cost, attractive polyethylene or vinyl-coated rigid set-up trays and tuck-lid boxes in a wide variety of sizes without adhesives or stay tape for frozen food, bakery products, etc.

THERMO-PAK box and tray forming equipment makes a *one-piece* corrugated glassine-lined box for cookies and other fragile products.

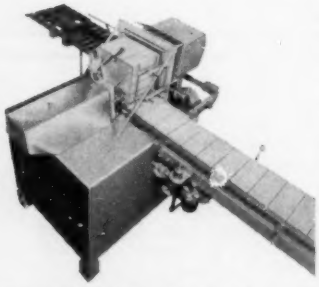
MARK 60 identifies the finest in versatility to form and "stay" boxes. Handles a wide range of board types and thicknesses. Precision, vacuum cup feeding—a 48" blank supply—convenient "Self Stor" pallets. Other models are also available.



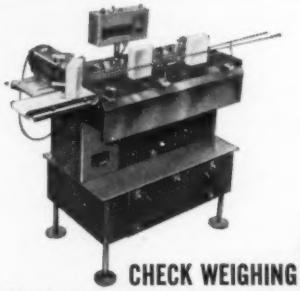
TRANSPARENT LID FORMING EQUIPMENT. Produces transparent lids of either acetate or polystyrene at speeds up to 30 per minute requiring an operator only to feed the blanks into the machine. Blanks require no prior scoring or bending. Machine creases and heat-seals the lids without complicated electronics or messy solvents. Lid sizes range from 3" x 2" x ⅛" up to 14" x 9" x 2½" or 13" x 8" x 3". Size changeover is quick and simple with no expensive forms required. Makes possible profitable production of transparent lids even on short runs.



SET-UP BOX EQUIPMENT. FMC setup box machines include wrappers, stayers, gluers, stackers, double enders, shapers, bendêrs, thumb-hole cutters, etc. A modern line of machinery to completely equip any setup box operation. The STOKESMATIC (illustrated) produces complete wrapped boxes or lids—either tight or loose wrap—from scored blanks without an operator. It coordinates six boxmaking functions into one continuous, automatic operation: corner cuts the blank, forms and stays the box, glues the label then precisely registers the box and wraps it. The unit is compact, requires only 7½" x 24½" of floorspace. Produces up to 40 units per minute.



PACKAGE CASING EQUIPMENT.
SURE-WAY package casers provide low-cost casing at speeds up to 500 packages or more per minute. Feed conveyor positions and aligns packages for proper gathering and assembly by the casing mechanism which discharges the filled case onto a belt leading to the case sealer. Adaptable to handle a wide variety of package and case sizes with end, top or side opening. Can handle virtually any product packaged in a rigid or semi-rigid container in a fast, trouble-free operation. Discharge point is flexible to fit space. Fully automatic model available to open, position, fill and seal cases.



HIGH SPEED CHECK WEIGHING EQUIPMENT
Check weighs up to 300 packages per minute detecting variations of as little as plus or minus ⅜% "on the fly." Fully automatic—requires no operator. The machine segregates each package according to preset tolerances, rejecting overweights, underweights, or both. Handles packages up to 10"x10" with weight ranges from 1 oz. to 3 lbs. Lower-speed models available for containers up to 10 lbs.

fmc CORPORATION ®

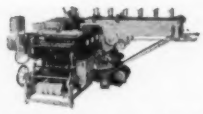
PACKAGING MACHINERY DIVISION

4942 Summerdale Avenue, Philadelphia 24, Pa.

WRAPPING MACHINES

9 ONE OF THESE

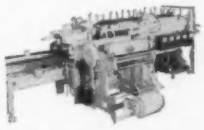
Battle Creek model 475's will soft film overwrap your thin, rectangular or irregularly shaped products at high speed



Model for 475 General Rectangular Applications



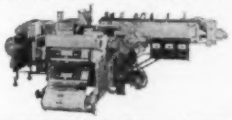
Model 475-H for Soft Irregular Products



Model 475-SN for Square Soft Items



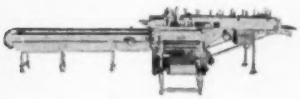
Model 475-S for Thin or Thick Items



Model 475-TS for Soft Rounded Shapes



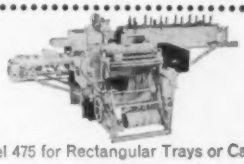
Model 475-TT for Irregular Products



Model 475-N for Paper Napkin Overwrapping



Model 475-T for Textile Products



Model 475 for Rectangular Trays or Cartons

products like these can be beautifully packaged at speeds up to 75 per minute



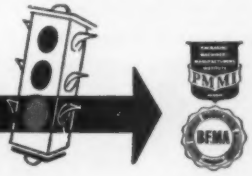




These newly developed machines have been thoroughly field tested in more than 100 installations. All machines create attractive, weld-sealed packages in polyethylene and most of the currently available plastic films besides being adaptable to films of the future. Our engineering service will help you choose from nine different Model 475's the machine best suited to your particular packaging needs. Send your inquiry in today.

Continuous Flow PACKAGING

BATTLE CREEK *packaging machines, inc.*, BATTLE CREEK, MICH



PMMI

BFMA

Packages that sell...



Packaging is part of your profit picture

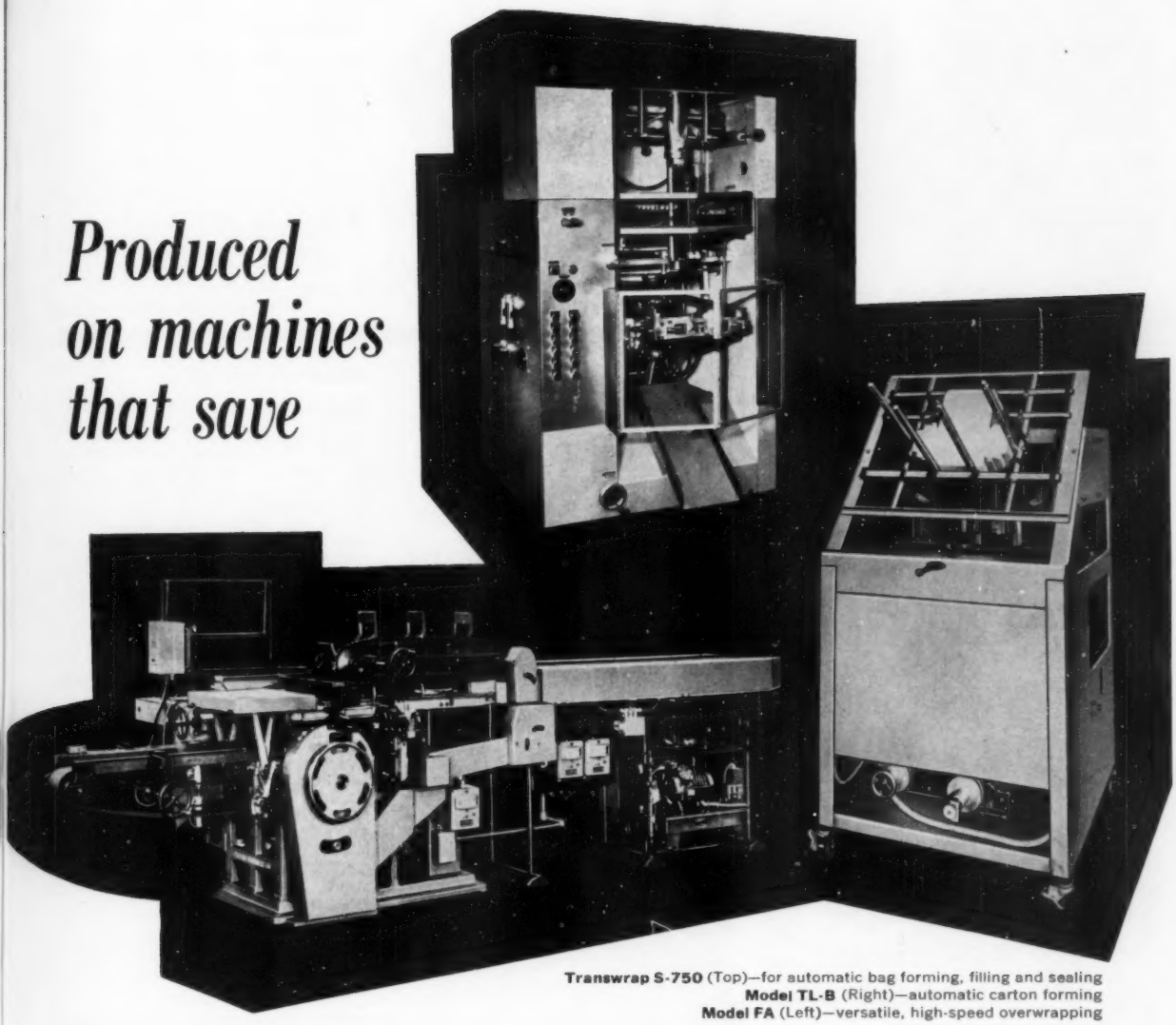
Few management problems can cut across as many areas as your packaging. Merchandising, production, cost control, product protection, shipping . . . all are involved. They make your packaging decisions far-reaching—and an important part of your profit picture.

They also warrant consideration of more than just the machines to do the actual wrapping. You want a smarter package for greater merchandising value, or increased production from automatic equipment to lower unit costs. There your Package representative can help.

From his analysis of your product, production and volume, we can engineer standard models to your exact needs. For at Package, we emphasize engineering development. We offer you the largest, most diversified line available from a single source.

Whatever your requirements, you can look to your nearest Package representative for expert guidance. He's versed in more than just machines and mechanics . . . he has the merchandising skill to help you add a competitive edge to your packages.

Produced on machines that save



Transwrap S-750 (Top)—for automatic bag forming, filling and sealing
Model TL-B (Right)—automatic carton forming
Model FA (Left)—versatile, high-speed overwrapping

Here are the basic operations handled by Package equipment, the largest and most diversified line available from a single source:

- **Bag forming, filling and sealing**
- **Carton forming**
- **Carton closing**
- **Overwrapping**
- **Direct Wrapping**
- **Bundling**
- **Candymaking and wrapping**
- **Wrapping bread and baked goods**

Package machines have been designed to work together as an integrated team whenever possible, and to handle all the latest packaging materials. In many cases, they will give you an almost completely automatic operation. By combining efficient, high-speed wrapping with a smart, distinctive end product, you get the results you want . . . packaging plus profit.

Your Package representative will be happy to give you a copy of Packaging Plus, an illustrated brochure that shows you the major machines, gives brief descriptions and size ranges. Call or write for a free copy.

PACKAGING IS PART OF YOUR PROFIT PICTURE

PACKAGE MACHINERY COMPANY, EAST LONGMEADOW, MASS.

NEW YORK • PHILADELPHIA • ATLANTA • BOSTON • CLEVELAND • CHICAGO • KANSAS CITY
DALLAS • HOUSTON • LOS ANGELES • SAN FRANCISCO • SEATTLE • TORONTO • MEXICO CITY

PACKAGE



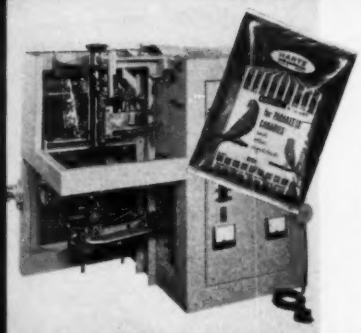
Cut Costs Now on FLEXIBLE PACKAGING

PRODUCT-ORIENTED MACHINES BY MERCURY MEAN

- *High-Speed Production . . .*
- *Better Packaging . . .*

at Low Initial Cost . . .
Low Operating Cost!

The complete Mercury line includes everything from a foot-powered bag sealer to high-production automatic packaging equipment. Modest in cost, efficient Mercury machines make automatic packaging feasible for the medium size, as well as larger plant. These versatile machines, product-oriented by our engineers, have solved difficult packaging problems for some of America's largest corporations. Investigate now the possibility of cutting your packaging costs. Our engineers will make recommendations without obligation. Write or call today!

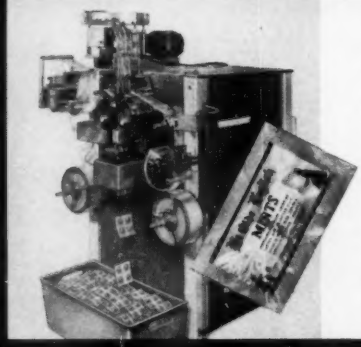


VERTI-PAK

Forms-Fills-Seals Pillow Packages Faster!

Produces better packages faster, per dollar of investment, than any similar machine. Eliminates pre-made bags, also separate filling and sealing operations. (In one typical plant, a Verti-Pak replaced five other machines and four operators.) Makes floor-level loading practical. One and two-tube models for any heat-sealing film, foil or laminate. High-efficiency feeding attachments (Including automatic scales) for any product—solid, liquid, powder or paste. Write for complete details now!

COMPLETE, AS LOW AS $6,000

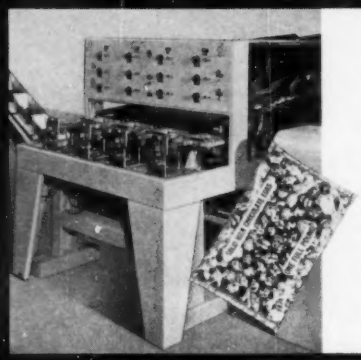


STRIP-O-MATIC

Single or Strip Pouches, Sealed 4 Sides.

Aligns two strips of film or foil in perfect register—then fills and seals automatically. Length of cut-off (single or multiple units from one to four rows wide) is easily changed by push buttons. Sealing rollers are interchangeable for packaging more than one product. Accurate control of temperature through twin heating elements results in strong, uniform seals for boil-in-the-bag and other packages. Available with choice of feeding devices for a wide variety of products. Write today!

COMPLETE, AS LOW AS $5,000



MERCO-MATIC Hi-Speed Scales

Accurate to ½ Piece (Aver.) per package!

The most accurate scales ever designed for hi-speed operation, built for floor-mounted or overhead installation. In synchronized units of 2 to 6 scales, Merco-Matic gains remarkable accuracy through construction features such as extrasensitive pivots, lower inertia ratio, independent scale assembly and precision vernier controls. A 4-unit Merco-Matic, in conjunction with a Verti-Pak, is now saving a Mid-west firm 5% of product, while reducing packaging costs 20%! Write for complete details!



VLS-12 Header LABELER

Attaches Labels, Seals Bags in 1 Operation!

The only Label-Sealer with all these features: Bag Holding Mechanism, automatically holds bag the instant it is placed before sealing jaws; Automatic Bag Ejector, disengages bag from jaws after sealing, Positive Label Pick-up; No-repeat Mechanism; Shock-Proof Thermostat. Available with hole-punch and code embossing features, or imprint attachment. Hundreds of VLS-12 Machines are now in use, producing some of the fastest-selling rack packages more economically. Write now!

COMPLETE, $1,470

For Information About Any Heat-Sealing Or Packaging Problem, Write:

MERCURY HEAT SEALING EQUIPMENT

MERCURY HEAT SEALING EQUIPMENT CO.

2601 N. HOWARD STREET • PHILADELPHIA 33, PA.

Nationwide Sales and Service Representation

WHY YOU SHOULD CONSIDER

CECO

BEFORE YOU BUY ANY CARTONING MACHINE

In the confusion of claims that every manufacturer makes for his equipment it is important to distinguish those features which are important to you. Some machines, for example, stress their high speed. Unfortunately, high speed and flexibility do not go together, and what you gain in speed you lose in flexibility. Consider for example, the CECO machines, where the major emphasis is placed on flexibility. The Model 45 as a typical, fully automatic machine provides cartoning speeds of up to 140 units per minute, yet provides a fast, convenient changeover that permits you to change from one carton size or shape to another in less than 25 minutes.

Another very important feature to look for in any cartoning machine is maintenance. Is the machine easy to maintain, or does it require a staff of engineers to keep it running smoothly? For example, consider this about CECO machines: by using sound engineering principles we have developed a line of machines that are extremely simple and inexpensive to operate.

Be sure to take into consideration too, the reliability and experience of the machine manufacturer. Some companies, like CECO have been manufacturing cartoning machines for twenty-five years. All the "bugs" have been engineered out – you buy a proven machine with a record of dependability. And, you are assured of a continuity of service and parts.

How about auxiliary equipment? By consulting a CECO sales engineer you can draw upon his broad experience in your industry. He can show you how CECO machines can be customized – with printers, coders, labelers, and special conveyor systems – to the exact job you require.

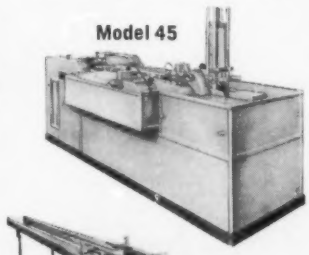
Today, in the face of fast-changing consumer package preferences, a CECO machine is added insurance that you can meet those changes with ease. Only CECO machines provide the fastest changeover possible from one size or shape carton to another, without special tools.

CECO machines are available to handle all types of cartons, from light paper board to heavy corrugated or heavy fiber board. They can be used for gluing or tucking carton flaps, and now, all models are available to handle edge-lock or center-lock cartons as well.

Write for literature, or we can arrange a visit to a CECO equipped plant before you buy any cartoning machine.

CONTAINER EQUIPMENT CORPORATION

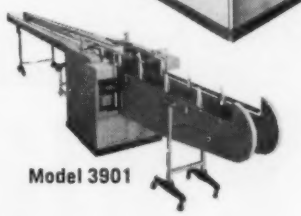
78 Locust Avenue, Bloomfield, New Jersey



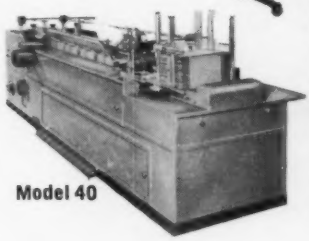
Model 45



Model 50

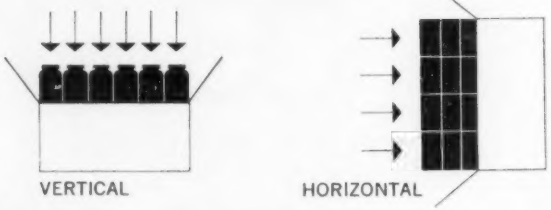


Model 3901



Model 40

STANDARD-KNAPP CASE LOADERS



Horizontal and vertical loading — cans, bottles, jars, bags, cartons.

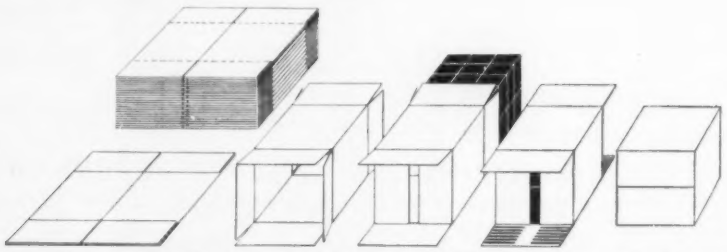
EXPERIENCE-ENGINEERED PACKAGING EQUIPMENT

STANDARD-KNAPP CASE SEALERS



Gluers with horizontal or vertical compression units.
Self-adjusting types. Automatic tape sealing units.

STANDARD-KNAPP INTEGER



STANDARD-KNAPP LINE Case openers — packers — gluers and sealers
Unscramblers — collectors — boosters — labelers
Forming equipment for plastics packaging

PUT YOUR PACKAGING PROJECT TO EMHART FOR EXPERIENCE ENGINEERING

EMHART MANUFACTURING COMPANY / PORTLAND DIVISION / PORTLAND, CONNECTICUT

EMHART

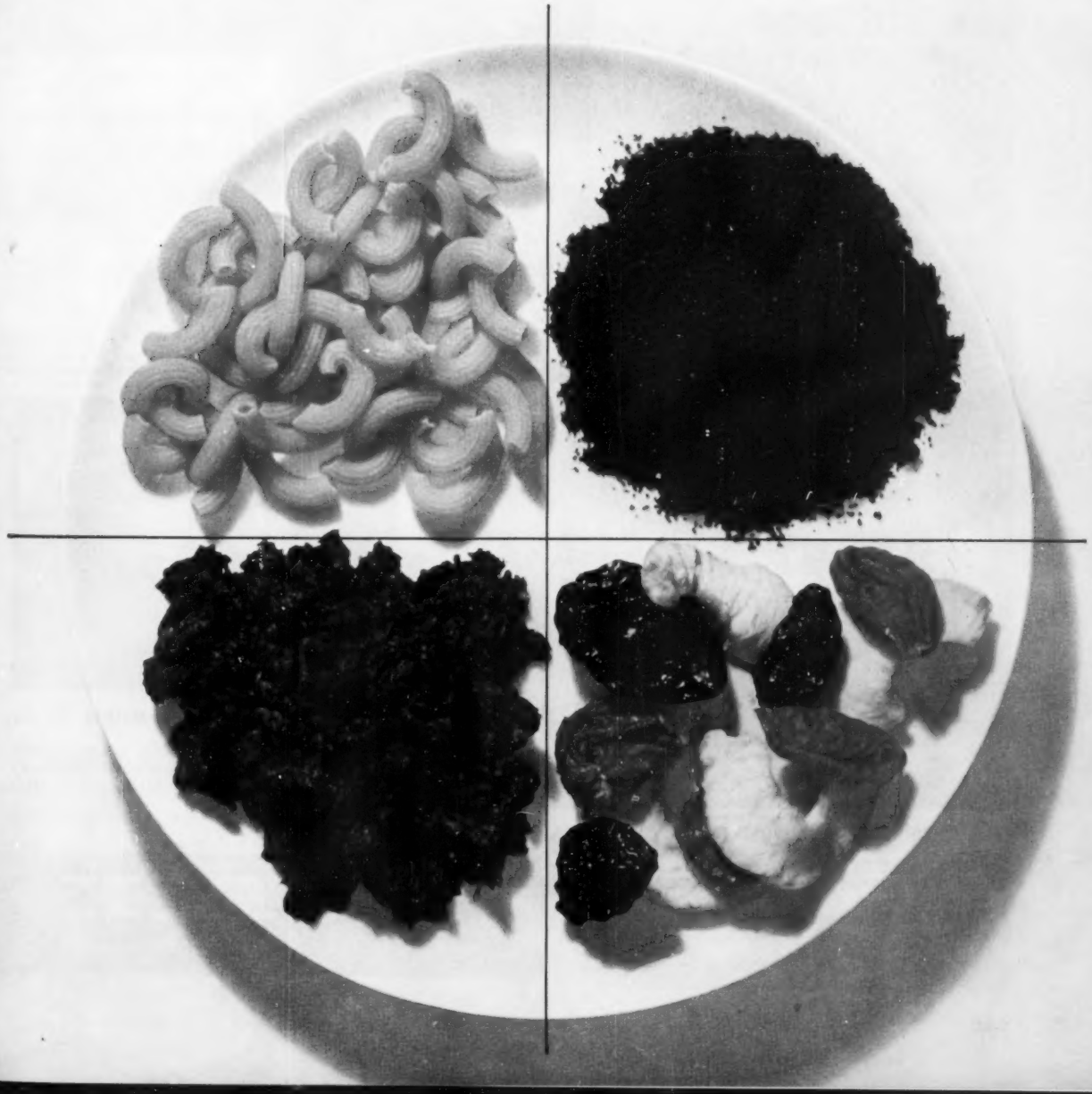
Whatever Product

you intend to pack, the Hamac-»Transwrap«® offers a rational and economical method in most cases. This automatic unit produces, fills and seals up to sixty pillow bags per minute, hour after hour throughout the day.

Whatever film you want to use, whether Poly, MSAT or any other flexible heat-sealing material, the Hamac-Transwrap will cope. More than a thousand units operating in conjunction with a great variety of – interchangeable – feed units, prove the high degree of versatility and adaptability of the Hamac-Transwrap. All our experience is at your service.

Hamac Hansella

Hamac-Hansella Maschinen GmbH, Düsseldorf, Western Germany



FILLING
HORIX
PASTEURIZING
COOLING

Shown here are just a few of Horix's complete line of Filling and Processing Machines.

HORIX offers a full line of automatic, semi-automatic and hand-operated fillers for handling liquids and semi-liquids into any size and shape container.

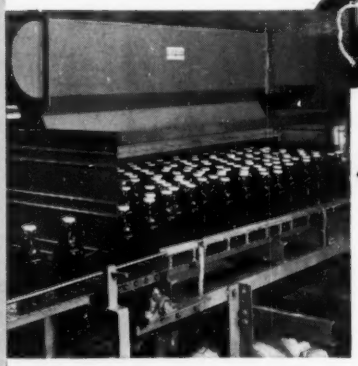
HORIX Processing Units are built as Coolers, Pasteurizers, Cookers and for combinations of these processes. Thermal Control System assures quality with positive equal treatment of every container.

FOR BOTTLING

HORIX FILLER MODEL HB-9-18

A versatile machine for handling many different products into any shape or size container from pints to gallons. Fill may be by gravity, gravity vacuum or pressure gravity, depending on product and container requirements. Every Horix provides extreme accuracy of fill and individual container control. There is no overflow and return system.





HORIX WALKING BEAM MODEL WB-6

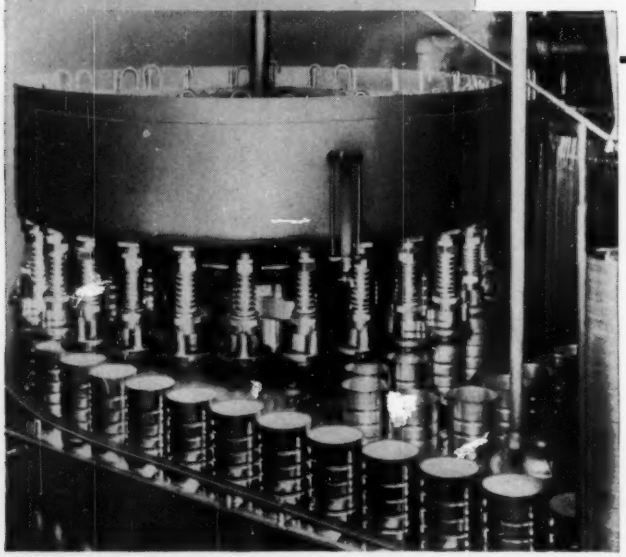
Furnished as a Pasteurizer, Cooler, or Exhaust Box. Positive control keeps containers evenly separated from entry, through processing, to discharge—no glass-to-glass contact. Widths 4', 6', 10', 12'; lengths to your requirements. Discharge end shown here with volume dryer.

FOR CANNING



HORIX ROLL-THRU MODEL RT-1-4

Designed for uniform processing of all can-packed products. Action is a slow, gentle roll, reversing itself at end of each runway. Saves floor space. Tandem units available for consumer sizes.



HORIX FILLER MODEL HAS-28

The filler that sets the standard for filling juices and concentrates into cans from 202 to 404. Holds accuracy record for filling citrus juice into 46 oz. cans. Accuracy maintained for life of machine. May be used with any appropriate can-closing machine.

Write for descriptive literature.

HORIX
MANUFACTURING CO. · PITTSBURGH 4, PA

NOW! BURSA-FILL

METERS, FILLS AND PACKS

ELECTRONICALLY -- ACCURATELY and completely automatically such difficult products to handle as:



Cottage Cheese — Cheese Dips — Potato Salad — Beef Stews — Chicken A-La-King Diced Meats & Vegetables Sliced Strawberries — Hot Cheese — Cherries — Juices Gravies — Creams — Jams Jelly — Ointments, etc.

BY AN ENTIRELY NEW CONCEPT

•

NO PISTONS

•

NO AUGERS

A NEW DISCOVERY. . . . The BURSA-FILL is especially designed to handle either fluids or semi-fluids -- with no masticating or deforming of product. It fills accurately at speeds never before accomplished. Fills from fractional ounces to 55 gal. drums and in continuous amounts.

Operates independently or will adapt to most filling machines.

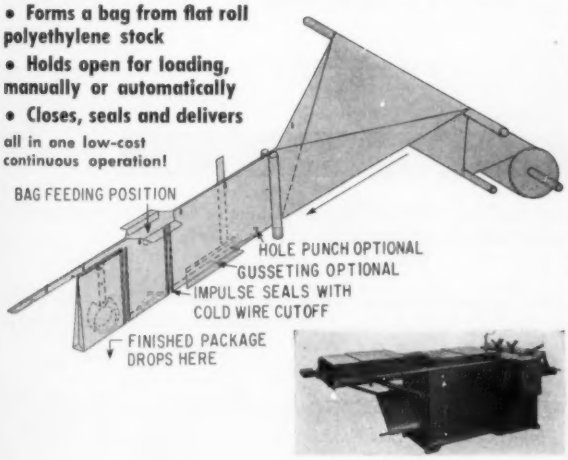
Write for information on this new cost-saver to: Dept. MPE

BURSAK PACKAGING MACHINERY CORP.
JACKSON, WISCONSIN

ONLY the "BODOLAY 34"

- Forms a bag from flat roll polyethylene stock
- Holds open for loading, manually or automatically
- Closes, seals and delivers

all in one low-cost continuous operation!



Give your product the glamour of polyethylene packaging —efficiently, economically—with the all-purpose Bodolay 34. One operator can package up to 1800 units per hour, change from size to size in less than 10 minutes!

WRAPPING MACHINERY
77 Warehouse St. Off Island Pond Rd.
Springfield 8, Mass.
RE 2-4689

FIRST

in production-line POLY-PACKAGING



. . . Bakery Goods

. . . Textiles

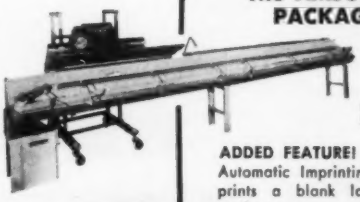
. . . Paper Goods

These and many other items are all being packaged by

The AMSCOMATIC® METHOD

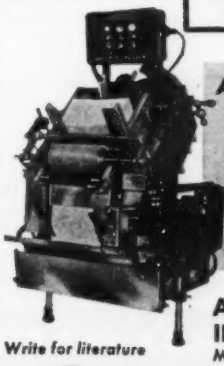
Of automatically producing a tight-to-product edge-sealed poly package

The AMSCOMATIC 100 PACKAGING UNIT



Available in 3 types of infeed conveyors to efficiently handle rigid or soft products or a combination of both . . . automatically.

ADDED FEATURE!
Automatic Imprinting and Ticketing. Imprints a blank label and applies to package.



AMSCO BAG SEALING MACHINES

AUTOMATIC SEALER/LABELERS
For sealing, header-labeling, imprinting, punching, code dating bags made of cellophane, polyethylene, saran, etc.

FOOT OPERATED JAW SEALERS
Models for straight sealing bags and pouches of all heat-sealable materials.

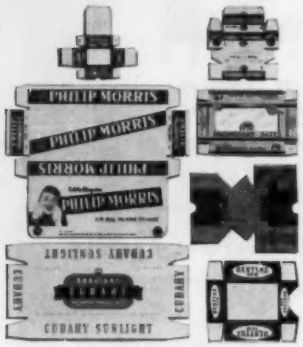
Write for literature

AMSCO DIVERSIFIED PACKAGING EQUIPMENT—For Bag Sealing, Bag Making, Bag and Carton Weighing and Filling, Materials Handling, Wrapping, Labeling, Sheeting and Gluing.

Amsco PM inc.

AMSCO PACKAGING MACHINERY, INC.
31-31 48th Avenue • Long Island City 1, N. Y.
Representatives in Principal Cities

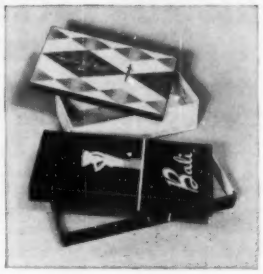
U. S. AUTOMATIC BOX MAKING & PACKAGING MACHINERY



BRIGHTWOOD BOX MACHINES

MODEL CM-2 High Speed Brightwood machine produces up to 120 finished pieces per minute. Size range from 3 x 2 x ¼″ deep up to 14 x 7 x 3½″ deep in styles as shown at left. Changeovers are quickly made at very moderate cost.

STANDARD An extremely versatile machine that automatically glues and forms boxes in a much wider range of sizes and styles than shown at left at speeds up to 60 per minute.



UNIVERSAL Full automatic for making a wide range of different sizes of boxes at low production costs. It forms and glues turned-over end boxes from creased or scored blanks with or without double side walls, in addition to standard single end boxes, at speeds up to 70 per minute.



AUTOMATIC TABLET BOTTLING MACHINES

The latest machines in various models for filling pills, capsules and tablets — coated and uncoated — into bottles or other rigid containers. With greatest accuracy of count; no tablet breakage; fully automatic or semi-automatic. Speeds up to 200 bottles per minute or more, depending on tablet size and count.



CANDY AND COUGH DROP CARTONING MACHINES

MODEL C-10 Automatically opens flat carton, tucks bottom, cuts liner from roll, forms and inserts liner, counts or volume fills candy then tucks in and closes liner and top flaps of carton. Liner can be omitted when desired. Speeds 60 per minute.

MODEL C-21 For small and sample size cartons. Two magazines feed flat cartons to opener, bottoms are tucked, both are filled simultaneously then tops tucked. Can be equipped for lining or wrapping or both. Speed 150 per minute.





FILLING MACHINES

"BOND" Automatic or semi-automatic models for packing, gross weighing or volume filling. Handles face powder, talcum, flour, soap powder, cocoa, etc. Speeds up to 120 per minute.

SCOTT Net weighers for weighing and filling coffee, rice, peas, tapioca, tea, crackers, etc. Semi-automatic; speeds up to 45 per minute with one operator. Fully automatic (rotary and straight line types); speeds up to 60 per minute.

SEND *us* DETAILS ON ANY OF YOUR PACKAGING PROBLEMS—WE HAVE THE MACHINES AND THE ENGINEERING BACKGROUND TO HELP SOLVE THEM

U. S. AUTOMATIC BOX MACHINERY CO., INC.

Owning and Operating NATIONAL PACKAGING MACHINERY CO. ★ CARTONING MACHINERY CORP.

122 ARBORETUM ROAD, ROSLINDALE, BOSTON 31, MASS.

Branch Offices: New York • Chicago • Springfield, Mo.

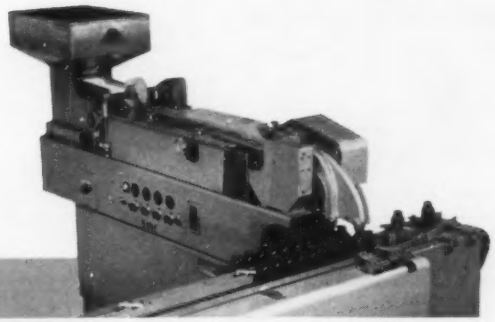
James C. Hale Co., Los Angeles, San Francisco • Roy F. Heller, Savannah • R. S. Gold, Toronto

PACKAGING MACHINERY MANUFACTURERS INSTITUTE PMMI MEMBER

PHARMACEUTICAL
PACKAGING EQUIPMENT

Lakso

Lakso offers a complete range of tablet and capsule counters, cottoning machines, tablet inspection machines, tablet cleaners and feeders and other special equipment for packaging small units such as candy, tablets, lozenges, etc. into random and pattern-fill packages.





Tablet and capsule counters

Machines fill from 1000 to 18,000 bottles per hour, total of eight different models, each designed to meet your needs. Straight line, rotary, and electronic machines available.

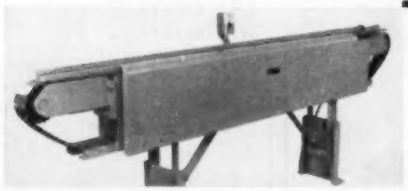
Cottoning machines

The Model 52 available as single or twin-head machine to run at speeds up to 200 bottles per minute, several models available to handle small vials up through large count packs of 1000.



Tablet inspection, cleaning, elevating-feeding

Machines to inspect tablets and capsules, de-dusting equipment, and high-speed Elevating Feeders equipped with sorting and vacuum dusting equipment.



Conveyors

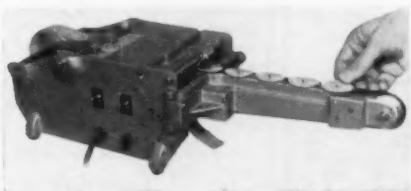
Self-driven, variable speed conveyors with new slim line style, rugged units suitable for all packaging jobs requiring handling of bottles, cans, jars, etc.

The Lakso Company, Inc. P. O. Box 442, Fitchburg, Mass., Diamond 3-3759

Factory sales and service branches: Westfield, New Jersey, ADams 2-2481 Aurora, Illinois, TWinoaks 6-4646

Sales agents: St. Louis CHestnut 1-1930 | Miami Plaza 1-0346 | Los Angeles DUnkirk 2-9284 | Toronto EMpire 4-1371 | Montreal REgent 9-6336

PACKAGING MACHINERY MANUFACTURERS INSTITUTE PMMI MEMBER



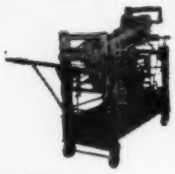
NEW PS-100 PRESSURE SENSITIVE LABEL DISPENSER

Machine feeds from a roll, automatically delivers a label to your finger-tips. No need for foot switch, speed control. The PS-100 feeds labels "on demand", adjusts itself to your labeling needs.

Better Labeling, Casing & Filling

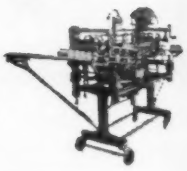
Series E Labelers

For glass and other cylindrical containers. Adjustable for all sizes from 112 to 403 dia. by 112 to 710 high and from 200 to 611 dia. by 200 to 708 high. Has sight-feed paste pot and hi-temp glue pot. Continuous label feed optional.



Series V Labelers

A lower priced labeling Machine for moderate speed operations. Has all the versatility of Model E and is adjustable to a wide range. Can be supplied for regular wrap-around or spot labels.



Container Feed Tables

Eliminate excessive labor costs by automatically accumulating and placing containers in a single or double line.



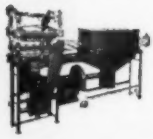
Gravity Type Caser

An inexpensive but highly efficient roll-in type gravity Caser with right-hand, left-hand or two side delivery.



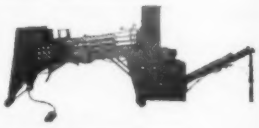
Jar Cleaning Lines

To handle wide-mouth jar or cans, blowing out dust and loose matter by air, or to sterilize with steam. Can be had with water jets for rinsing.



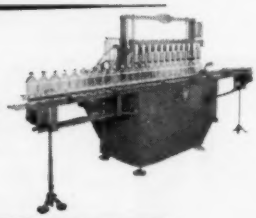
High Speed Casers

The new Model BK illustrated is the fastest Caser, delivering up to 24 cases per minute with double-discharge.



Liquid Fillers

Glass, tin or plastic containers—fill them with CRCO fillers. Hand operated to fully automatic models to suit your requirements.



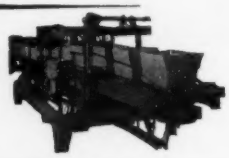
Model EC End Caser

To automatically case all types of cylindrical containers, except glass, in end opening type shipping cases.



Gluing-Sealing

The newest ideas in economical gluing and sealing with enclosed glue lines that do not need constant cleaning.



Write Dept. MPE for further information

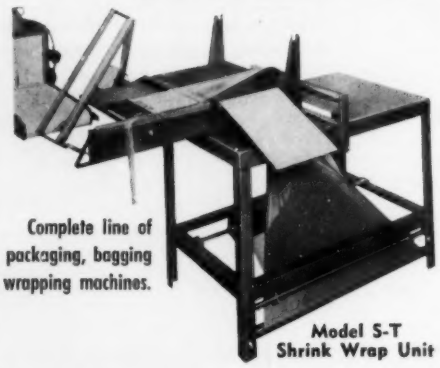
The Best in Labelling Filling and Packaging Equipment

Chisholm-Ryder

COMPANY OF PENNSYLVANIA

HANOVER, PENNSYLVANIA

SAVE up to 50% with QUICKPAK



Complete line of packaging, bagging and wrapping machines.

Model S-T Shrink Wrap Unit

New QUICKPAK units form polyethylene bags from bulk stock—for an endless variety of products. QUICKPAK elimi[illegible]s costly ready-made-bags, lets you save up to 50% of your present bag cost, up to 30% of labor cost!

QUICKPAK models start as low as $149.50—can be leased at about 3% of selling price per month. Write *today* for complete details!

Manufactured by the originator of heat-sealing packaging machines

QUICKPAK MACHINERY CORP.

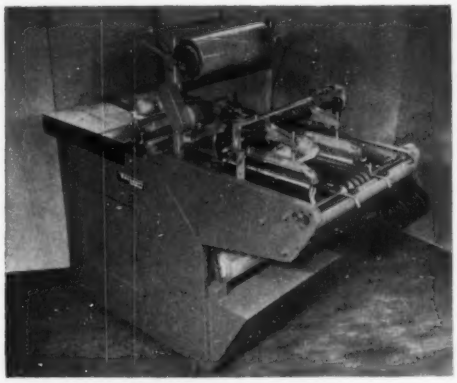
WASHINGTON BLVD. & MELVIL ST., CULVER CITY, CALIFORNIA.

UPton 0-4405

Packaging Machinery Specialists Since 1932

AUTOMATIC CONTOUR WRAPPING MACHINE for All Shrinkable Films

TRESCO-WRAP AR-12



Wraps with complete all around hairline seal, with all oriented shrinkable films or ordinary polyethylene or polypropylene. No folds to waste film and obscure the contents of the package. After sealing, the package passes thru a shrink tunnel. The film shrinks, taking the shape of the package and becomes a glorifying, protective skin. The AR-12 is completely operated by one large cam. Maintenance costs are low.

1200-1500 large packages per hour; 2400-3000 small units per hour. Records—Puzzles—Cosmetics—Tennis Balls—Fruit and Produce—Pizza Pies—Toys and Games—Xmas Tree Ornaments

Write for bulletin on Tresco-Wrap, Shrink Tunnels and allied products for shrinkable films.

THE TRESCOTT COMPANY, INC., Fairport, N.Y.—Lu 6-0553.

Single or

multiple pieces...

by bulk,

weight,

or count...

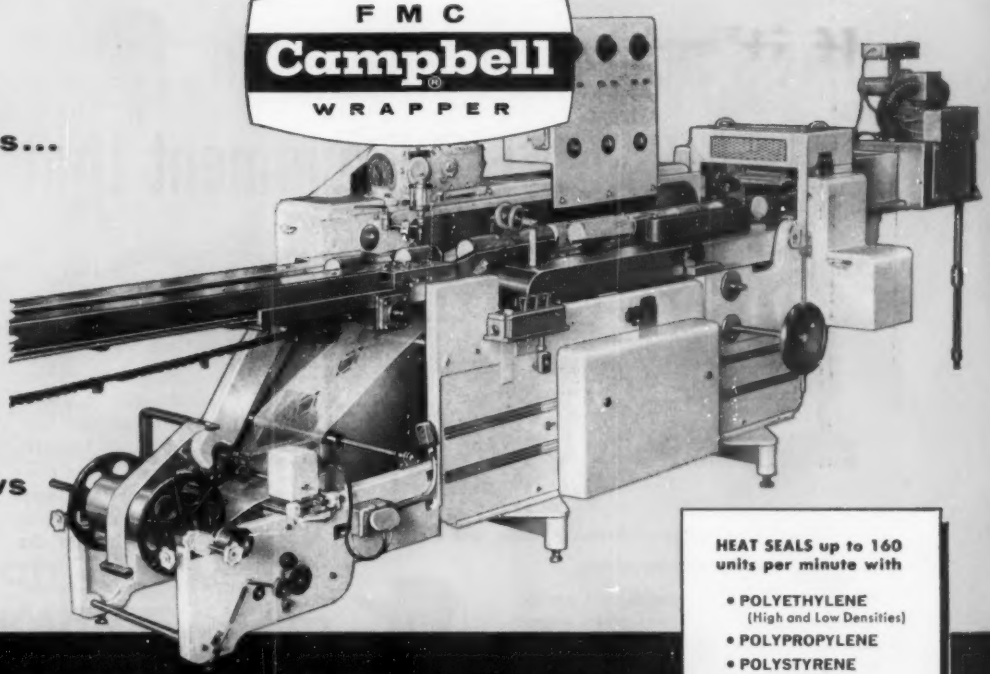
stacked in rows

or on edge...

FMC

Campbell®

WRAPPER



HEAT SEALS up to 160 units per minute with

- POLYETHYLENE (High and Low Densities)
- POLYPROPYLENE
- POLYSTYRENE
- POLYVINYL CHLORIDE (PVC)
- PLIOFILM
- K FILMS
- CELLOPHANE
- SARAN • VIDENE
- CRY-O-VAC

The versatile FMC Campbell Wrapper wraps and seals with Poly, Shrink Films and all other packaging materials Faster - and at Less Cost!

Automatically wraps, seals and delivers products of every description at high speeds without static or heat sealing problems —

Whatever your product's shape . . . whatever your plans for packaging, whether in single or multiple pieces . . . by bulk, weight or count . . . in rows or on edge, chances are you can break any packaging bottleneck with an FMC CAMPBELL WRAPPER. There's practically no limit to the types of products packaged either; for they include foodstuffs, meats, confections, baked goods, household and hardware items, paper & textile products — and others, too numerous to mention. High speed packaging up to 300 units per minute with cello, etc. — And up to *160 per minute* with practically every known type of heat-sealable flexible material—*including shrink films!* Features are many, including ■ Neat, close fitting wrapping ■ "Float wrapping" without crush or breakage of soft or fragile products ■ Automatically regulated heaters and dwell time to insure positive longitudinal and cross sealing ■ Continuous feed, 1 person operation ■ Material savings up to 35% ■ Conversion from Poly to Cellophane in less than 30 minutes. Write for complete information today.



Typical products packaged in Poly and Shrink Films on an FMC Campbell Wrapper.

fmc CORPORATION®

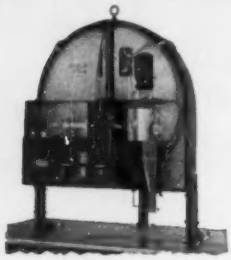
FMC CORPORATION

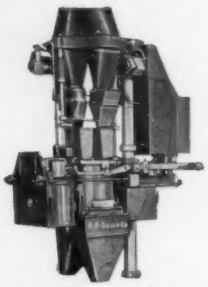
HUDSON-SHARP PLANT

1201 Main Street, Green Bay, Wisconsin

If it's *accuracy* you need...

here's **Weigh-Fill Equipment** that *pays off!*

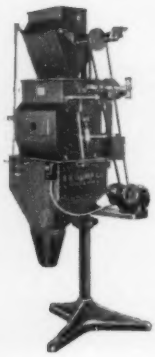


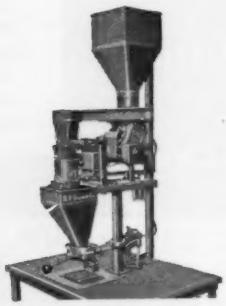


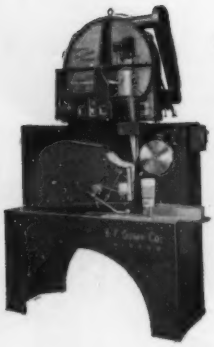
Bar-Nun "Auto-Check," Edtbauer-Duplex, and Gumpco

AUTOMATIC NET WEIGHERS

Wide range of sizes and models, with gravity, mechanical power or vibratory feeds, assures accurate weights in discharges from ¼ ounce to 75 pounds.







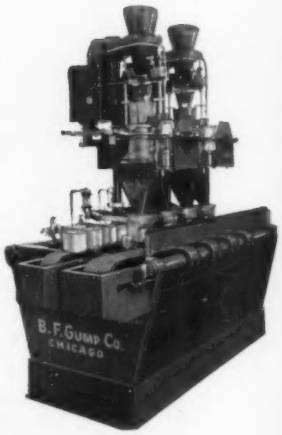
BAG FEEDERS AND WEIGHERS

Several sizes for discharge of ¼ ounce to 5 pounds.

Bags—kraft, glassine, or plastic—are fed from magazine, opened, held, weigh-filled, and ejected. Operating speed, 22 to 28 bags a minute. One operator can tend two machines. Choice of several weighers assures accurate weights. All models can be integrated with Tempo-Vane bag tucker and bag sealer to provide a completely automatic bag line.

AUTOMATIC LINES
for Cans, Jars, Cartons

Gump weighing and packing lines are available in several sizes, to automatically feed, fill, pack and eject containers at speeds up to 150 per minute. Any of several Gump weighers can be mounted in the line, depending on the product and weight to be handled, to assure consistent, high accuracy. Packing is spill-free and dense ... makes possible the use of smaller containers for some products.



Consistent, high accuracy of GUMP weighing equipment benefits two ways: it stops costly overweights and safeguards against underweights. Wide range of sizes and models, with several different types of feed mechanisms, provides this extreme accuracy in weighing a variety of dry products from fine powder to relatively large particle size, such as hard candies, nuts, beans, etc., and flake and crystalline chemicals—practically anything but liquids. Other economies include maximum production, savings in labor costs especially where one operator can tend several units, and maintaining uniform production pace in the packaging department. Several models, either as single units or in multiple, can be integrated with other packaging equipment into automatic packaging lines.

Use GUMP Engineering Service

GUMP engineering, both in the design of the various units and their application to specific problems, will give you the ultimate in uniform, dependable accuracy in your weighing and filling operations. Complete details with recommendations and test reports on your products and packages will be gladly supplied without any obligation.

Other GUMP Handling Equipment—ViBrox Packers • Bar-Nun Rotary Sifters • Draver Feeders for Proportioning, Blending, and Flow Control • Elevators and Conveyors

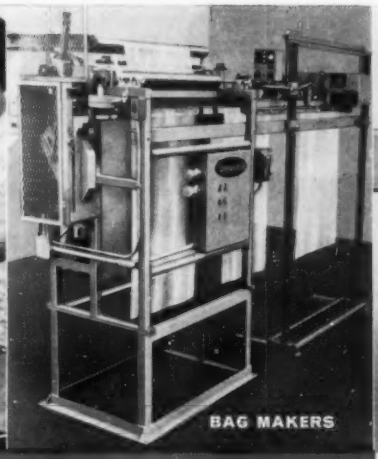
B. F. GUMP CO. **1307 S. Cicero Ave., Chicago 50, Ill.**

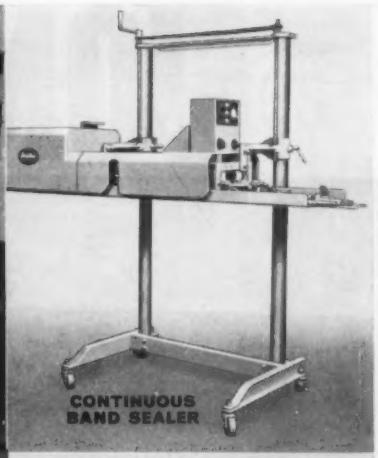
Engineers and Manufacturers since 1872

SALES AND SERVICE

New York 36—JABEZ BURNS AND SONS, INC.—600 West 43rd Street
San Francisco 5—TEMPO-VANE MANUFACTURING CO.—330 First Street
Dallas 2—J. B. WILLIAMS—1026 Young Street


GLUE SEALERS


BAG MAKERS


CONTINUOUS BAND SEALER

Which Doughboy Package System do you need?

Shown here are some of the examples of packaging, sealing, labeling and coding systems developed by Doughboy engineers to meet specific problems. One of the systems shown here may be just what you're looking for.

Chances are, however, that your problems are different. And this is where Doughboy really excels. Doughboy has designed packaging systems for literally hundreds of manufacturers. Doughboy systems are right now packaging such diverse items as hard-goods, soft-goods, foods, even livestock feeds and fertilizers.

Films used for these specialized systems include polyethylene, pliofilm, vinyls, cellophane, glassine, coated papers, scrimback, laminates . . . you name it, we've sealed it.

So if your problem is different, call Doughboy. (If your problem is run-of-the-mill, call us, too! We can save you big money!)

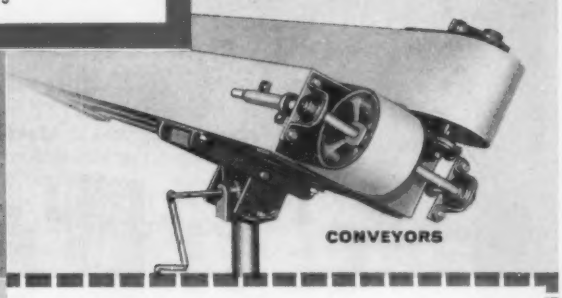
MECHANICAL DIVISION • DOUGHBOY INDUSTRIES, INC., NEW RICHMOND, WISCONSIN

Manufacturers of heat sealing machines and conveyors


POWER HEAT SEALERS


BAG TOP LABELERS


ROTARY (CRIMP) SEALERS


CONVEYORS



UNIPAX VERTICAL SEALERS

MECHANICAL DIVISION
DOUGHBOY INDUSTRIES, INC.
New Richmond, Wisconsin

Please send us information on the packaging of_____

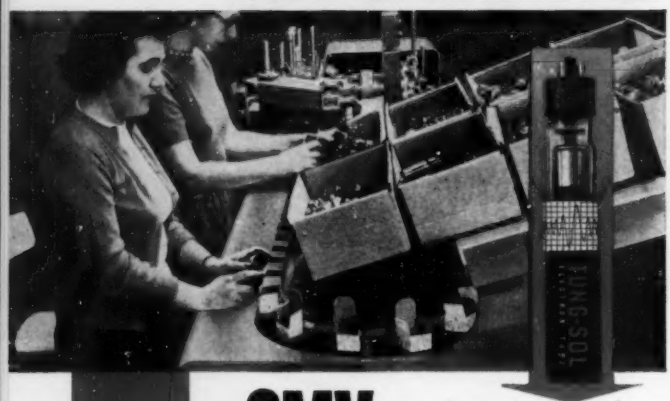
_____

Name_____

Address_____

City_____ State_____

JONES fully automatic and ser

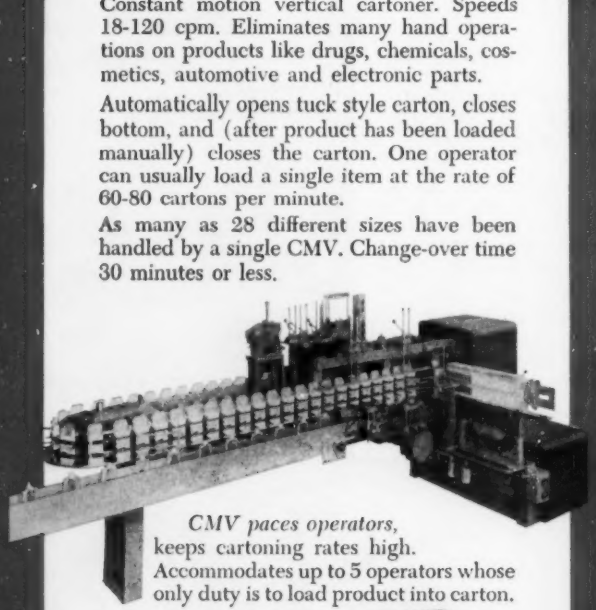


CMV semi-automatic

Constant motion vertical cartoner. Speeds 18-120 cpm. Eliminates many hand operations on products like drugs, chemicals, cosmetics, automotive and electronic parts.

Automatically opens tuck style carton, closes bottom, and (after product has been loaded manually) closes the carton. One operator can usually load a single item at the rate of 60-80 cartons per minute.

As many as 28 different sizes have been handled by a single CMV. Change-over time 30 minutes or less.



CMV paces operators, keeps cartoning rates high. Accommodates up to 5 operators whose only duty is to load product into carton.



CMC fully automatic

Constant motion cartoner. Speeds 25-400 cpm. Automatically loads product into carton.

Automatic operations performed by CMC: feed, open and form cartons; insert single or multiple loads; glue or tuck flaps of cartons. CMC can also be designed with provisions for folding and inserting leaflets, code dating, feeding corrugated liners and related operations.

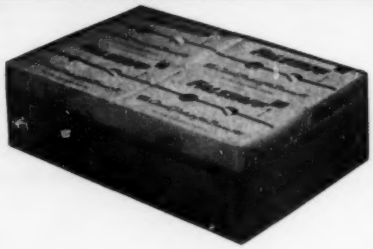
CMC automatically increases cartoning production *with* savings in reduced labor and maintenance and *without* plant expansion.



CMC cartoned products include crackers, frozen foods, flexible pouches, tubes, cakes, razor blades, paper tissue and napkins, foil wrapped bars, rolls of cotton, face cloths, bottles, cans and many others.



automatic case packers



Jones automatic case and tray packers readily implement modern merchandising and production packaging techniques for beer, soft drinks, canned food, margarine and similar products. Efficient, automatic operation at speeds up to 50 cases/min. or 120 cans/min. Write for information on ACP, CMP and CMTP models

semi-automatic cartoning machines



Plasti-Lok PLASTIC COLD FOLDING MACHINES

New Jones Plasti-Lok machines cold fold oriented styrene sheeting, to form a rigid, transparent tray offering broad new merchandising opportunities. Write for descriptive Plasti-Lok bulletins.



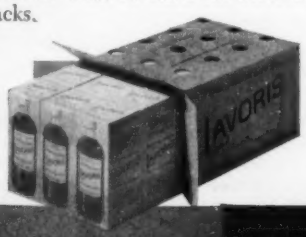
NMC fully automatic

Nova (intermittent) motion cartoner. Automatically loads single products into cartons at speeds of 18-80 per minute; and automatically collects and loads several cartoned products into overpacks, shelfpacks or bootpacks at speeds of 20-40 per minute.

Products cartoned singly on the NMC: cotton swabs, books, crayons, steel wool pads, polyethylene bottles. Overpacks handled by the NMC: sugar cubes, spark plugs, electron tubes, cartoned bottles and others.



At the Lavoris Co., the NMC receives cartons of Lavoris from the CMC, automatically collects and loads twelve 4-oz. or six 9-oz. cartons into shelfpacks.

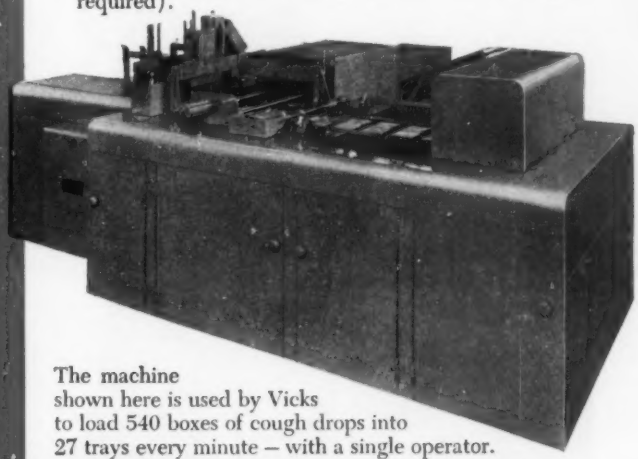


NMTP fully automatic

Nova (intermittent) motion tray packer. Combines automatic tray forming with automatic loading. Speeds 10 to 30 trays per minute.

The NMTP automatically feeds flat tray, forms it, inserts it in a rigid pocket, collects, stacks and inserts 20 Vicks cough drop boxes through end of tray, closes and seals flaps.

Performance like this cuts packing costs automatically. Saves you money on material, labor and equipment (extra tray forming machines no longer required).



The machine shown here is used by Vicks to load 540 boxes of cough drops into 27 trays every minute – with a single operator.

NEW cartoning idea book



Over a hundred cartoning case histories contained in this new 20-page brochure just off the press. Write for free copy of "Cartoning and Case Packing Ideas."

Bulletins also available on the design, construction and operation of the CMC and CMV.

R. A. JONES & COMPANY, INC.
Cartoning Machines - Case Packers

P.O. Box 485, Cincinnati 1, Ohio

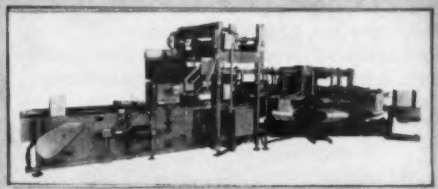
Branch Offices: *New York • Chicago St. Louis • Atlanta • Dallas • Los Angeles • San Francisco • Seattle Montreal • Mexico D.F.*

What?

Feed all these different sized cases, in random order, into one automatic case sealing installation?



Yes! It's being done. The Omnimatic-Rotopress automatically seals and discharges corrugated shipping containers of widely varying dimensions, fed to it in random order, at speeds up to 20 cases per minute. A choice of pre-set discharge patterns permits the simultaneous use of as many as five different Rotopress discharge stations, with sealed cases of different heights automatically discharged to separate take-away conveyors. The G. E. installation shown below, employing a unique circular compression unit, occupies only 144.9 square feet, and permits random feeding of cases that may vary in length from 8″ to 30″, in width from 6″ to 22″, and in height from 6″ to 18″. This machine can be built to accommodate your particular range of case sizes.



Packomatic Omnimatic-Rotopress operating at the General Electric Company's Trumbull Lamp Plant at Warren, Ohio.

WRITE for 8 page technical brochure giving complete design, application and dimension data. Request Packomatic Brochure 100-60.

Packomatic®

T.M. Reg. U. S. Pat. Off.

PACKOMATIC
TEXTILE MACHINE WORKS
Reading, Pa.

Cable Address: TEXTILE • Phone Franklin 4-8311

OLIVER offers you this all-new versatile machine for wrapping products in soft plastic films

Now plan to wrap your products in polyethylene and other soft plastic films with their many decided advantages of extra protection and economy. You can choose almost any heat-seal wrapper – polystyrenes, polyvinyl chlorides, polypropylenes, cellophane – that best displays, protects and preserves your products. The eye-appeal and pleasant feel of these films will give your packaged products a merchandising edge on competition.

Check these outstanding Oliver features . . .

1. The Oliver uses ordinary polyethylene – plain or printed, high, medium, low density of 1¼ mil and up – and all other soft plastic films.
2. It is most versatile. Make a complete change for package size quickly. Speeds up to 60 packages a minute.
3. The vacuum sheet-feed belt assures positive film feed without distortion.
4. The Oliver thermostatic control system holds sealing temperature within close limits. The cooling system assures heat removal for strong, positive seals.
5. A roll-type labeler can heat-seal an attractive diecut label to the surface of the package.
6. The wrapping film can be made as snug or loose around the product as you desire.
7. Choose from two types of bottom and end seals: overall or narrow line seal.
8. Machine can be furnished with vacuum-type feeder for flat cards and U-boards fed to infeed flights. A photoelectric cell is available.

The Oliver automatically wraps single or multiple unit packages. Handles hard or soft products without crush or damage. Choose the model that best fits your needs. *Write today for folder describing this all-new Oliver No. 899 Wrapping Machine.*



GET THE LATEST FACTS ON WRAPPING . . .

- *The Oliver sales engineering office is headquarters for the latest ideas in automatic wrapping and labeling.*
- *Oliver also makes a one-man versatile automatic wrapping machine to handle up to 40 packages a minute, using waxed paper, cellophane and all the newest soft plastic films.*
- *Send us your product. We'll wrap it and give you an accurate estimate of its wrapping cost. Or present your special wrapping and labeling problems to our staff for a paying solution.*

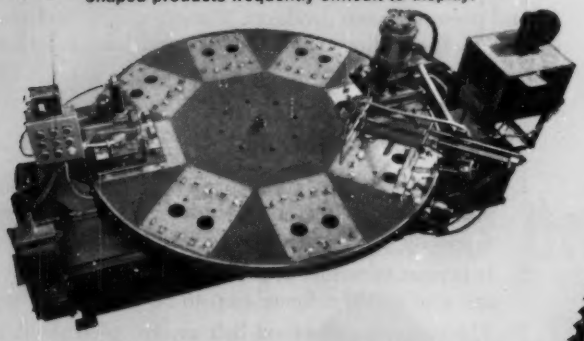
OLIVER MACHINERY COMPANY

PACKAGING DIVISION

Grand Rapids 2, Michigan

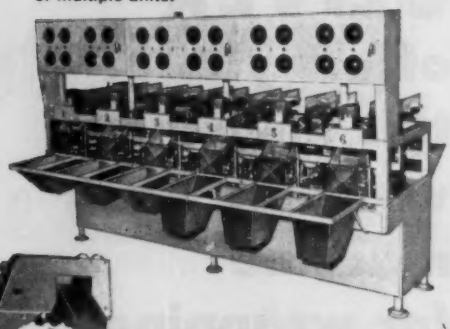
STRETCH-PAK MARK III

Manufactured for Inpak Systems, Inc., the new Mark III stretch packaging machine continues to set new records in production efficiency creating an attractive, pilfer-proof, visible package for odd-shaped products frequently difficult to display.



WEY-MOR MODEL WM-65-R

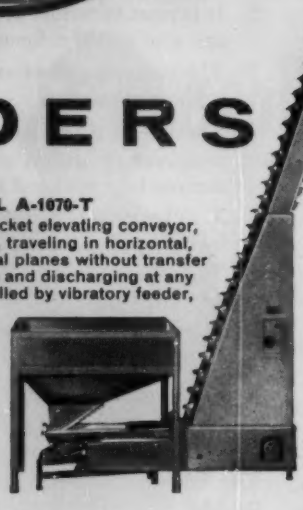
High-speed, specially engineered net weight scales, extremely accurate and smooth in operation, for dependable, trouble-free integration with existing equipment or in a completely automated Lynch system, single or multiple units.



LEADERS LOOK TO

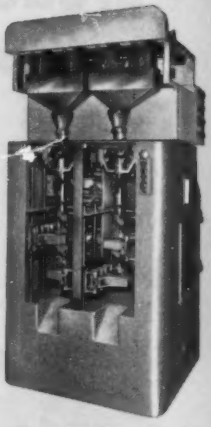
ROBO-LIFT MODEL A-1070-T

Materials-handling bucket elevating conveyor, portable or stationary, traveling in horizontal, inclined and/or vertical planes without transfer of product, picking up and discharging at any number of stations. Filled by vibratory feeder, belt or gravity chute, Robo-Lift handles powders, mixes, pellets, granules or solids smoothly and gently to processing or packaging equipment.



ROBO-WRAP MODEL 200-NW

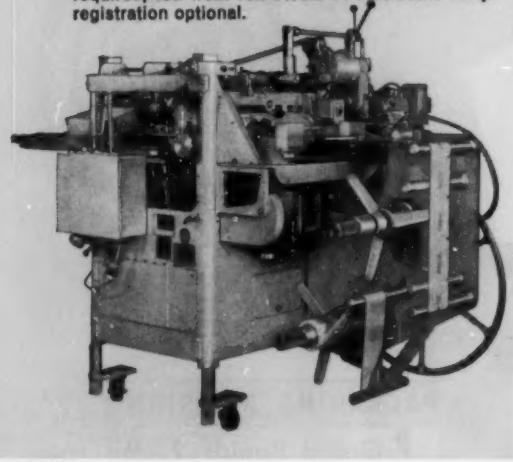
Forms, fills, seals up to 120 single or double wall pillow packs per minute, using heat seal cellophane, paper, polyethylene, PVA, plastic or laminates. Unique hand-over-hand action pulls down hard-to-handle materials evenly, holds jaws in sealing position longer to assure perfect seal. All main drive components accessible.



PACKAGING WITH

WRAP-O-MATIC MODEL A

Packages fragile and/or irregularly shaped bakery and confectionary items, novelties and industrial products in a neat, sealed package, up to 140 per minute. Accommodates glassine, cellophane, waxed paper, laminates or mounted foil in heat-seal or glue-seal packages. Bottom cards or U-boats as required, fed from roll stock. Photoelectric wrap registration optional.





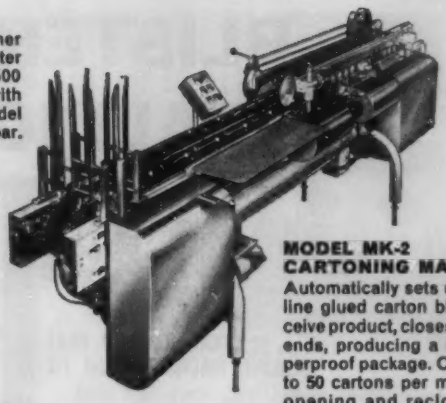
MODEL SMW-10

Makes, wraps and seals up to 120 ice cream sandwiches per minute. Continuous freezer extrudes ice cream, wafer is added from each side, positioned by indexing wheels. Sandwich is tight-wrapped and heat-sealed in a neat, sanitary package for delivery to hardening room. Economy, high performance.

MORPAC MODEL TF-KEF-V

Combination print former, wrapper and cartoner designed to package quarter-pound prints of butter and margarine at speeds approximating 2500 pounds per hour. Efficient and dependable with accurate weight control. A new improved model has been developed and will be available this year.

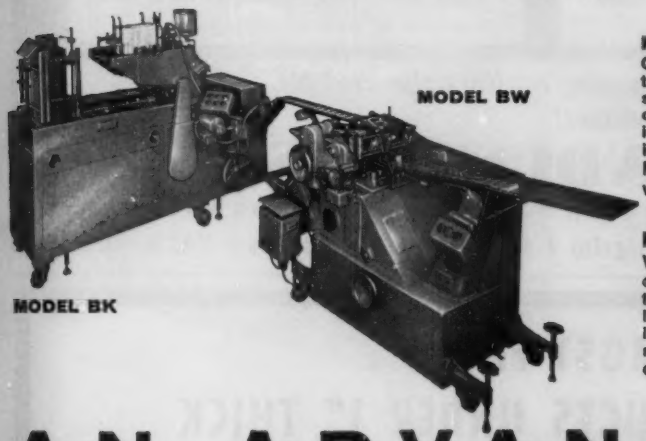




MODEL MK-2 CARTONING MACHINE

Automatically sets up straight line glued carton blank to receive product, closes and seals ends, producing a rigid, tamperproof package. Capacity up to 50 cartons per minute with opening and reclosing features optional.

LYNCH FOR



MODEL BW

MODEL BK

MORPAC MODEL BK

Collator and cartoner accumulates in various multiples, places in economical wrap-around blank and seals carton. Handles candy bars, hardened ice cream bars and slices, soap tablets and other small items at speeds up to 40 cartons per minute. Loading from one or both sides, one to four layers. One Model BK handles production of two Models BW, when integrated.

MORPAC MODEL BW

Wraps and seals candy bars, ice cream bars and other uniform, rectangular products at speeds up to 150 per minute. Electric eye wrapper registration, harmonic motion product feeder and elevator, side loading twin arbor brackets, torque-limiter, automatic product flow switch for integrated infeed conveyor operation.

AN ADVANTAGE!

Lynch automated systems offer *versatile* solutions to almost every packaging problem—be the product free flowing or plastic, jellied or granular, liquid or solid, animal, vegetable or mineral. Lynch engineers have been partners in the packaging progress of scores of the most respected brands in the market. For a complete evaluation and detailed recommendation at any stage of planning (preferably from the start), consult our sales engineers without obligation. Special materials, enclosures, drives, feed and discharge designed to your requirements.

LYNCH
CORPORATION
Anderson, Indiana

Manufacturing Engineers of automatic processing equipment in the glass, packaging, plastic and other industries.

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LEADERS LOOK TO LYNCH FOR MACHINES THAT PACKAGE ALMOST EVERYTHING

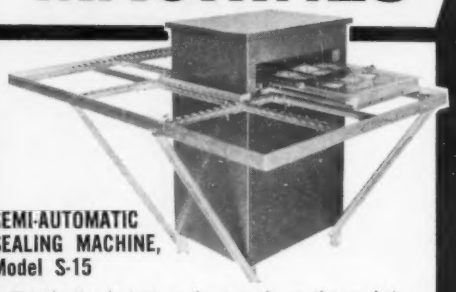
SENTINEL

BLISTER HEAT SEALING MACHINES



BLISTER FILM TOP HEAT SEALING MACHINE, Model F-2

Ideal for packaging foods, candies, etc., where heat must hit only edge of package, not contents. Handles blister cavities up to 9" x 7" x 4" deep; **seal can be either peelable or boilable.** Production rate (approx. 30 cycles per min.) faster than any competitive unit! Accessories available for patented method of a pleated easy-open feature or a tear strip.



SEMI-AUTOMATIC SEALING MACHINE, Model S-15

This is the fastest semi-automatic on the market, capable of blister packaging products 12" x 15" x 4". Turns out 15 cycles per minute, drastically reduces board curling. Features automatic time, temperature and pressure adjustments.

Custom-built, fully automatic sealing machines also available.
Contact factory for complete details!

PACKAGING INDUSTRIES LIMITED, INC.

THE WORLD'S LARGEST MANUFACTURER OF BLISTER PACKAGING MACHINERY

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wrap-ade

HIGH SPEED UNIT PACKAGERS

FOR MOST FLAT PRODUCTS UNDER 1" THICK

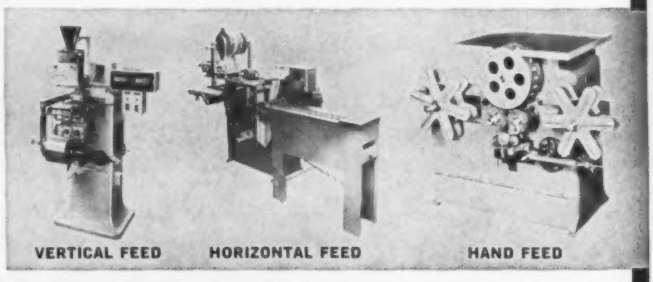
• TABLETS • SOFT GOODS • FOOD PRODUCTS
• HARDWARE • FRAGILE COMPONENTS



TYPICAL FIN SEAL PACKAGES

If you are merchandising your product directly to the ultimate consumer, packaging for distributor sales, packaging for efficient and economical plant inventories, or packaging for necessary product isolation and protection, there is a Wrap-Ade Unit Packager suitable to your production and market requirements.

Send us a sample of your product today for our prompt quotation.



VERTICAL FEED HORIZONTAL FEED HAND FEED

wrap-ade

SINCE 1932

MACHINE CO., INC. 188 Sargeant Avenue Clifton, New Jersey
Phone: PRescott 3-6150

For lower cost packaging . . . greater flexibility

mrm the mark of dependability

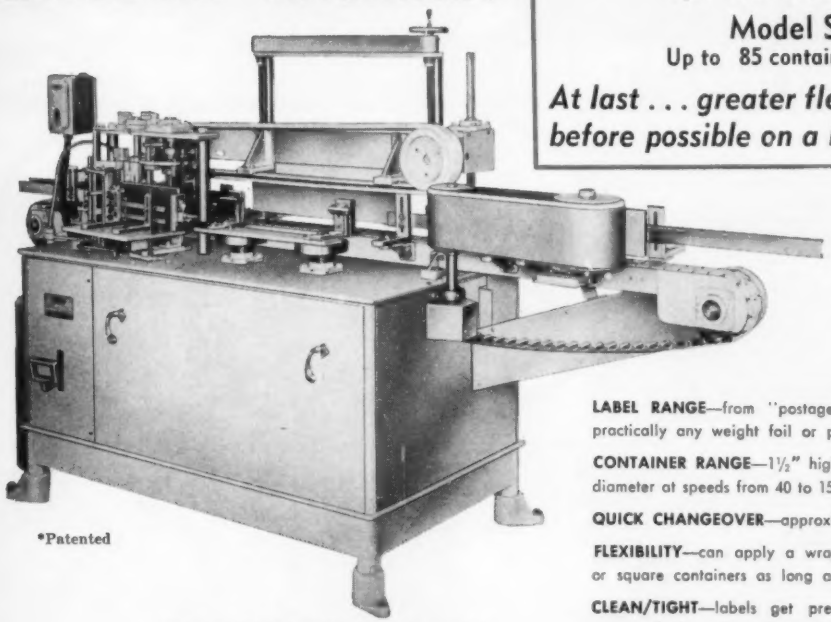
Filling and Labeling Machines

Continuous motion, fully automatic LABELING* MACHINES

Model CML-150
Up to 150 containers per min.

Model SL-85
Up to 85 containers per min.

At last . . . greater flexibility than ever before possible on a labeling machine!



*Patented

LABEL RANGE—from "postage stamp" size to 6" width x 7" long in practically any weight foil or paper material.

CONTAINER RANGE—1½" high by 1" diameter through 12" high by 6½" diameter at speeds from 40 to 150 per minute.

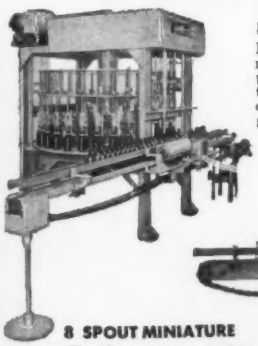
QUICK CHANGEOVER—approximately 15 minutes.

FLEXIBILITY—can apply a wrap-around label to round, rectangular, oval or square containers as long as label size does not exceed 7" in length.

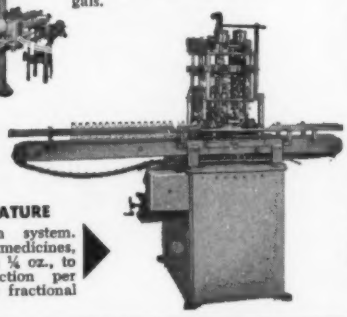
CLEAN/TIGHT—labels get precise overall coating of adhesive (to the extent of absorption of paper fibers) eliminating any possibility of excess glue extending beyond the label area.

Write for Catalog CML-860. Has complete details of MRM LABELING MACHINES. Also fast-growing list of firms using MRM equipment.

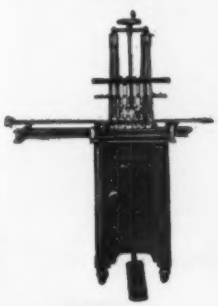
GRAVITY, VACUUM and VOLUMETRIC FILLING MACHINES FOR EVERY REQUIREMENT



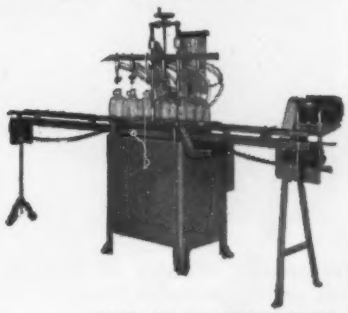
30 SPOUT MACHINE
Equipped with 50 gal. removable tank. Production per minute: to 250 fractional oz., 225 pts., 180 qts., 150 half gals., 75 gals.



8 SPOUT MINIATURE
Closed vacuum system. For perfumes, medicines, etc. Range from ¼ oz., to 16 oz. Production per minute: to 150 fractional oz.



MODEL 8 PORTABLE
4 to 6 spouts. Production per minute to 40 fractional oz., 24 pts., 12 qts.



MODEL MR-12 STRAIGHTLINE
6 spouts for ⅛ and 1 gals., 12 spouts for fractional oz. up to gals. Production per minute: to 75 fractional oz., 50 pts., 40 qts., 18 half gals., 12 gals.

Write for literature

Special Machinery Division
We can design and build a special machine to fit your specific packaging needs

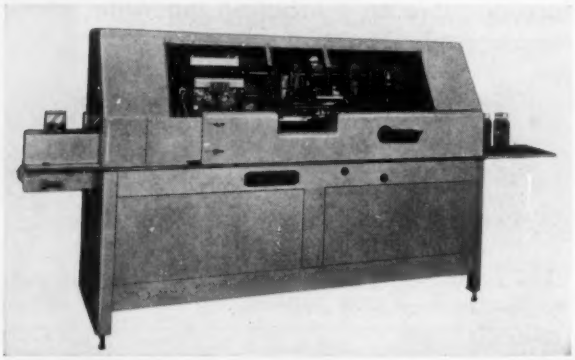
mrm company, inc.
Bethpage Parkway, Plainview, L. I., N. Y.

Peters

PACKAGING MACHINES

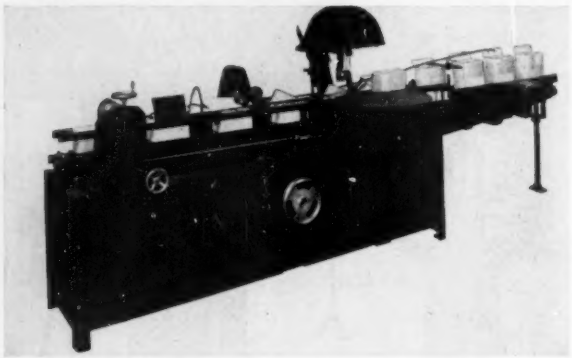
PRODUCE BETTER PACKAGES AT LOWER COST

• You want top-selling, low-cost packages that offer consumer appeal, convenience, and store and ship well. Packages made with Peters automatic packaging machinery have these qualities.



PETERS MODEL L-2—Bag Sealing and Header Applying machine that receives filled gusset-type cellophane bags from packing conveyor, times them into the machine, tucks gusset, applies header or label, heat seals bag and label and discharges completed package. Operates at speeds up to 70 per minute.

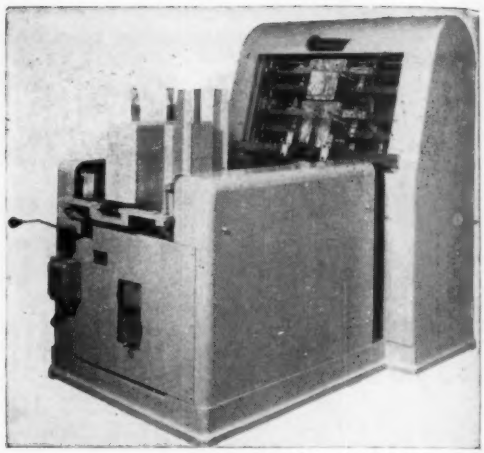
PETERS MODEL CCY-L—Folds and closes lined cartons at speeds up to 120 or more per minute. Model CCY closes unlined cartons.



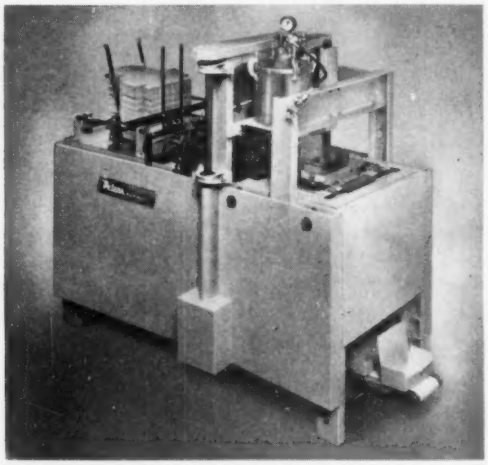
For specific analysis of your operation, send carton tray or bag samples.

Peters MACHINERY COMPANY

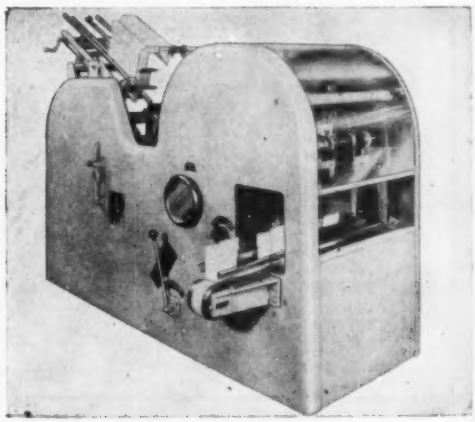
4712 Ravenswood Avenue • Chicago 40, Illinois



PETERS MODEL SG—This Carton and Tray Forming and Gluing Machine handles cartons or trays at speeds up to 175 or more per minute.

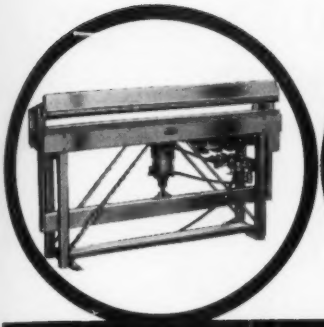


PETERS MODEL PG—Forms and glues up to 70 cartons and trays per minute! Handles a wide range of carton and tray sizes. Closed glue system eliminates costly make-ready and cleanup. Change-over time: 5 minutes.



PETERS MODEL SE—A Carton Forming and Lining Machine that forms and lines cartons at speeds up to 120 per minute.

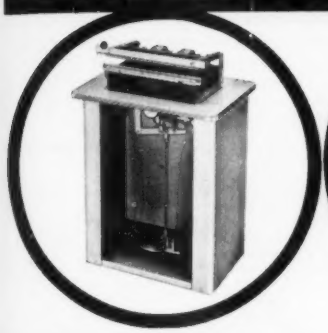
VERTROD

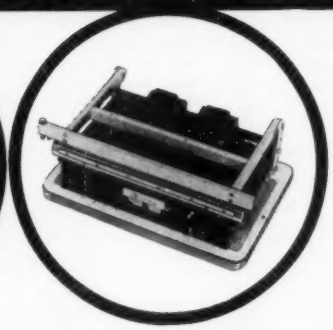




THERMAL IMPULSE HEAT SEALERS FOR ALL FILMS & FOAMS

Vertrod is the oldest manufacturer of Thermal Impulse Heat Sealers. Our complete line of highly efficient sealers are designed to meet most sealing requirements. They deliver uniform positive seals and trim-seals without continuous heat. No warm-up periods required. Seals all thermo-plastic materials and laminations such as: Polyethylene, Saran, Pliofilm, Vinyl, Polyvinyl Alcohol, Polyflex, Rigid Vinyl, Nylon, Mylar, Kel-F; Polyurethane Foam, Polystyrene and Acetate. Dependably built, they need a minimum of maintenance and have built-in safety features. Seals can be made through wrinkles, gussets, liquids and powders. Hand, foot-pedal and electromagnetic or pneumatic power-operated models up to 96" long. Special sealers made to fit unusual sealing problems.





Vertrod Thermal Impulse Sealers are manufactured under one or more of the following U. S. patents: 2,460,460; 2,479,375; 2,509,439; 2,574,094; 2,630,396; 2,633,433; 2,640,796; 2,640,798; 2,650,183; 2,675,054; 2,682,294. Canadian Patents 468,140 and 496,237. Other Patents Pending.

Write for FREE Descriptive Literature

Vertrod Corp.

Pioneers of Thermal Impulse Heat Sealing

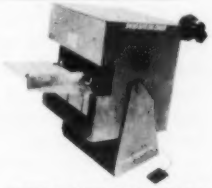
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The Bagging And Sealing Packaging Service Used Throughout The World ... acclaimed most efficient by engineers



SPEEDY BAG PACKAGER

SPEEDY BAG PACKAGER used for hundreds of items is small and compact. It is sturdy, and well constructed for years of efficient service. It can be used with polyethylene, cellophane, paper bags, etc.



SPEEDY AUTO-BAG SEALER

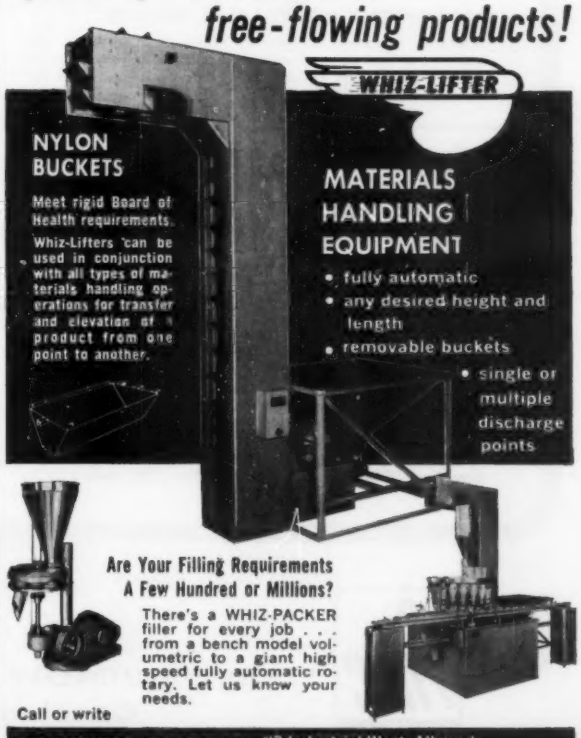
SPEEDY AUTO-BAG SEALER is labor saving. It is automatic. When used in combination with **SPEEDY BAG PACKAGER,** one operator can deliver 1200 plus trim-sealed packages per hour.

FREE ENGINEERING SERVICE: Send us 15 to 20 samples of the bag you are using, also samples of your product. Our engineering department will then make recommendations, without obligation, as to the model and size packaging and sealing machines best suited for your packaging operation.

ERRICH INTERNATIONAL CORPORATION

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Speed-up movement of free-flowing products!



Are Your Filling Requirements A Few Hundred or Millions?

There's a WHIZ-PACKER filler for every job . . . from a bench model volumetric to a giant high speed fully automatic rotary. Let us know your needs.

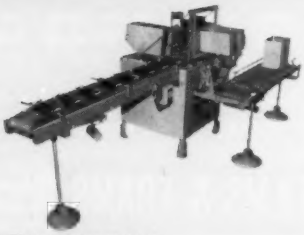
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You'll get the Most in economical, automatic, high-speed operation

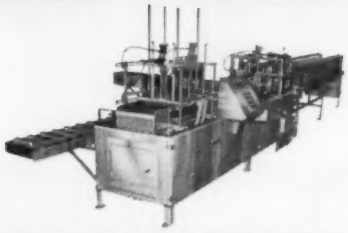
...with fmc

Can and Package Casers



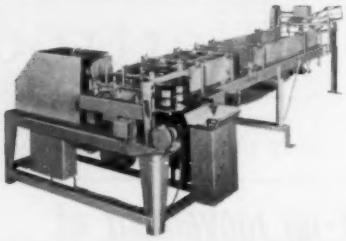
"SURE-WAY" PACKAGE CASER

Designed to convey, position, assemble and load packages into shipping cases in a continuous, high-speed automatic operation. Available in 11 different models for filling top-open, side-open and end-open shipping cases. Extremely flexible—handles a wide range of products and packages.



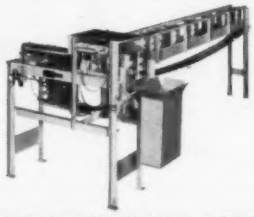
"SURE-WAY" FULLY-INTEGRATED CASING LINE

Composed of three completely synchronized automatic units: the "Sure-Way" Case Set-Up Machine, Package Caser and Case Sealer. Offers the ultimate in speed, efficiency and savings in operator manhours. Many other special accessories make this the most flexible unit in the field.



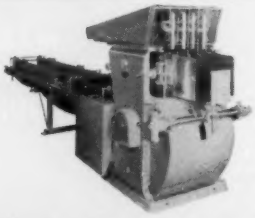
FMC NON-SHOCK END-OPEN CASER, MODEL 20

Specially designed to load single tier can patterns into economical end-open shipping cases. Permits fibre savings up to 15%. Loads up to 1200 cases an hour. Ideal for 46 oz., #10 and #12 cans.



FMC NON-SHOCK END-OPEN CASER, MODEL 10

An extremely well-constructed low priced machine, specially designed for single tier loading of cans into end-open shipping cases at relatively low or medium rates of production. Loads 10 cases a minute on #12 and #10 cans; 7 to 9 cases on 46 oz. and 307 diameter sizes. Has all the important "Non-Shock" features.



FMC NON-SHOCK TOP-OPEN CASER, MODEL 3

For continuous, high-speed lines loading single or multiple tiers into top open shipping cases. Empty case is placed over loading chute; balance of cycle is completely automatic at speeds up to 1200 cases per hour. Handles can sizes from 202x308 packed 6x8, to 603x700 packed 2x3.

FMC is one of the world's leading manufacturers of casing equipment. Illustrated here are but a few of the complete FMC lines, including the famous "Sure-Way" line of package casers and associated equipment, which is distributed exclusively by FMC. If your product is packaged in a can, box, carton, or other rigid or semi-rigid container, or if the product itself takes a rigid shape, chances are you can case it better for less with FMC precision-engineered equipment. Let your FMC representative work with you in the best solution to your specific casing problem.

fmc FOOD MACHINERY AND CHEMICAL CORPORATION

Putting Ideas to Work

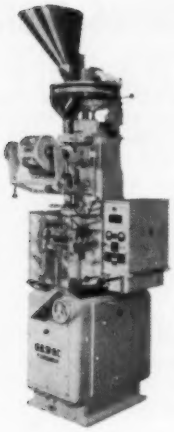
FOOD MACHINERY AND CHEMICAL CORPORATION

Canning Machinery Division

General Sales Offices:

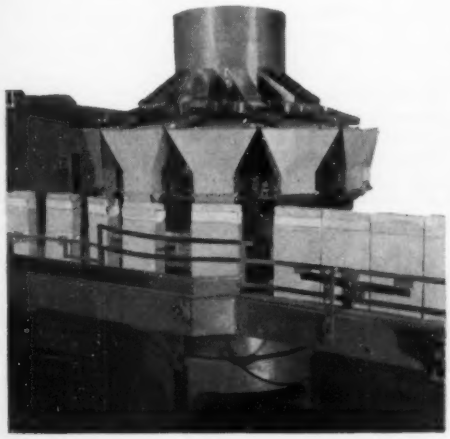
WESTERN: SAN JOSE, CALIF. • EASTERN: HOOPESTON, ILL.

Do You Have Packaging Problems?



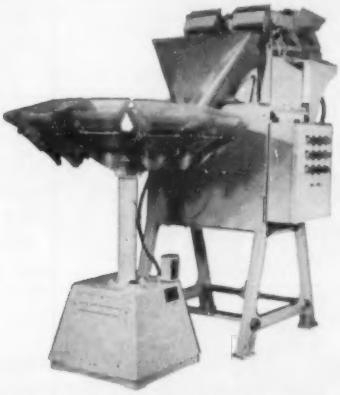
Hamac-Hansella "Transwrap"

Automatic bag forming and packaging system now available with Wright weighers, or volumetric (above), auger and pump feeds. Rugged construction. Smooth, quiet operation.



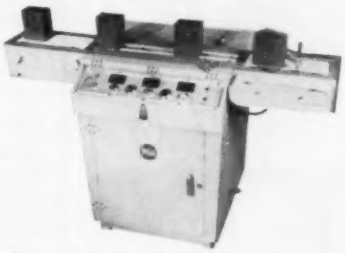
Wright NT Weigher

A completely automatic rotary net weigher for high speed packaging in containers the total output of a continuous process.



M-2 Hy-Tra-Lec® Weigher *with New Speed Fill Turret*

A Semi-Automatic System to precision weigh a wide variety of products into bags, boxes, jars, or cans. The new Speed Fill Turret allows greater ease and speed for attendant.



Wrightronic® Checkweigher

100% checkweighs articles in motion at high speeds with extreme accuracy. The unit can be used to reject packages over and under acceptable weights. Counters provide total production tally of over, under, and correct weights.

Wright Machinery Company has a complete line of weighing and filling equipment for free-flowing, hard to handle products for manufacturers packaging ½ ounce to 16 ounces. Wright engineers will adapt the recommended machine or system to suit your requirements. Speed, accuracy, and gentle product handling are features included in all equipment. For information on how Wright can solve your packaging problems, write us on your letterhead; for detailed information on above machines, just fill out the attached coupon.

Packaging Machinery Since 1893

WRIGHT MACHINERY COMPANY / *DIVISION OF SPERRY RAND CORP. DURHAM, NORTH CAROLINA*

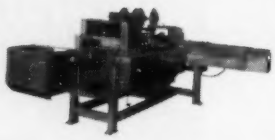
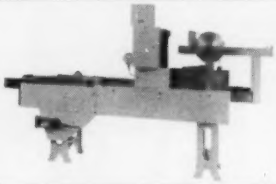
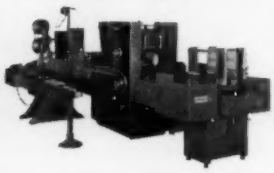
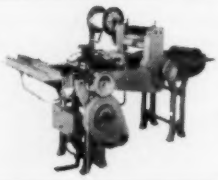
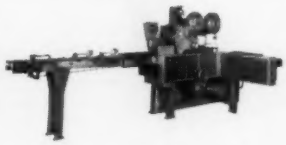
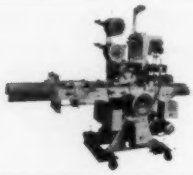
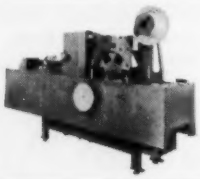
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LITERATURE ON.....

...wrapping, bundling, cartoning & banding machines from SCANDIA

SERIES *100*		**Medium-priced fully automatic wrapping machines for single packages, multiples and bundle-wraps.**	Surprisingly fast models in this newly designed Series for wrapping, multiple wrapping and bundling operate in the speed ranges of machines costing much more. Feature Scandia's three-sides method of folding and sealing the packaging material with or without opening-tape. Produce a strong wrap for bundles and permit varying collations for best display and easy shelf stacking. Especially adaptable for supermarket multiple and Holiday wraps.
SERIES *300*		**"Tray Topper" hooding and crimping machines for applying foil covers to frozen dinner trays.**	Three basic models in Scandia Model 300 Series apply foil tops to frozen dinner trays in continuous one-level motion at speeds up to 120 trays per minute. Engineered to meet rigid food industry specifications.
SERIES *400*		**Fully automatic cartoning machines.**	Model 400 Series, the latest packaging machinery development of Scandia's engineering department, introduces a new concept to the field of cartoning: the forming of a carton blank around the product automatically. Designed for cigar pocket-packs initially, other models are now available for cartoning cigarette packages and multiples of other products.
SERIES *500*		**Low-priced wrapping machines for single packages, multiples and bundle-wraps.**	Model 500 Series wrapping machines are three-quarters automatic in operation and are ideal for lower volume production, or for use while developing new packages and packaging techniques. Machines in this series are the backbone of Scandia's Rental Program.
SERIES *600*		**Adjustable high-speed fully automatic wrapping machines for single and multiple packages.**	There are six Models in this "work horse" Series to choose from for overwrapping the full range of package sizes—from razor blade tucks to cigar 5-packs to cake mixes and frozen foods.
SERIES *700*		**High-speed turret-type wrapping machines.**	Especially designed to meet rigorous specifications of the cigarette industry, more than 1,000 of these machines are now in round-the-clock service throughout the world turning out universally recognized cigarette packs with handy opening-tape. Other Models in the 700 Series are used to wrap pipe tobacco, candy, cough drops and drugs.
SERIES *800*		**High-speed heavy-duty fully automatic bundling machines.**	Using kraft paper or film, Models in this Series are used for high-production bundling of a wide variety of products in the drug, toiletries, tobacco, and food fields.
SERIES *900*		**Custom-built high-speed automatic banding machines.**	Originally developed for the soap industry to band multiple units of bar soap at high speed, other Models in the 900 Series are available for banding stationery, stacks of labels and for "premium" work.

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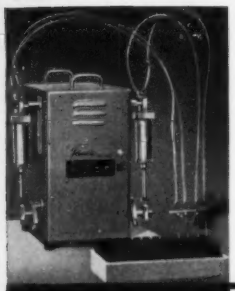
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NOW—FILL ANY LIQUID WITH THE NEW Filamatic



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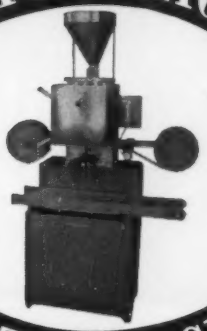
Fills Free-Flowing, Viscous and Foaming Liquids!

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- Adjustable suck-back
- 1% filling accuracy

Solve your filling problems with the new Filamatic—the **only** portable, volumetric filler that handles all liquids. Provides drip-free filling of water-thin products, heavy oils, viscous adhesives or foaming lotions. Fills polyethylene bottles, glass or metal containers. Single drop to 16 oz. capacity increases to 2½ gallons with Multi-Stroke Attachment. Write today for new 12 page brochure.

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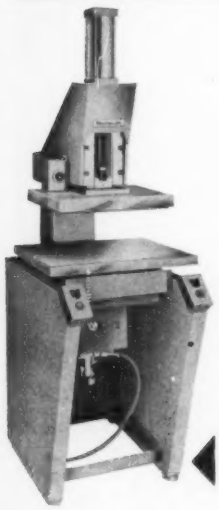
PMMI Booth 706 Model FFL

Fast-Faster-Fast

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CONTINUOUS & INTERMITTENT MOTION
DEVELOPED FOR SHORT RUN PACKAGING
EASY MAINTENANCE—COMPLETE FLEXIBILITY
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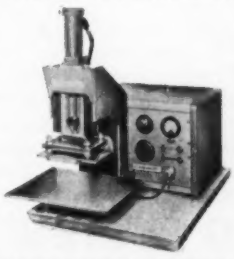
LEADING MANUFACTURER of automative parts chooses Sealomatic Blister Packager Model BP25 for sure, economical packaging of its line of marine spark plugs.

Sealomatic electronic heating and sealing equipment can boost production and profits—lower costs—for *your* operation too! Call, write or wire collect for full information today!



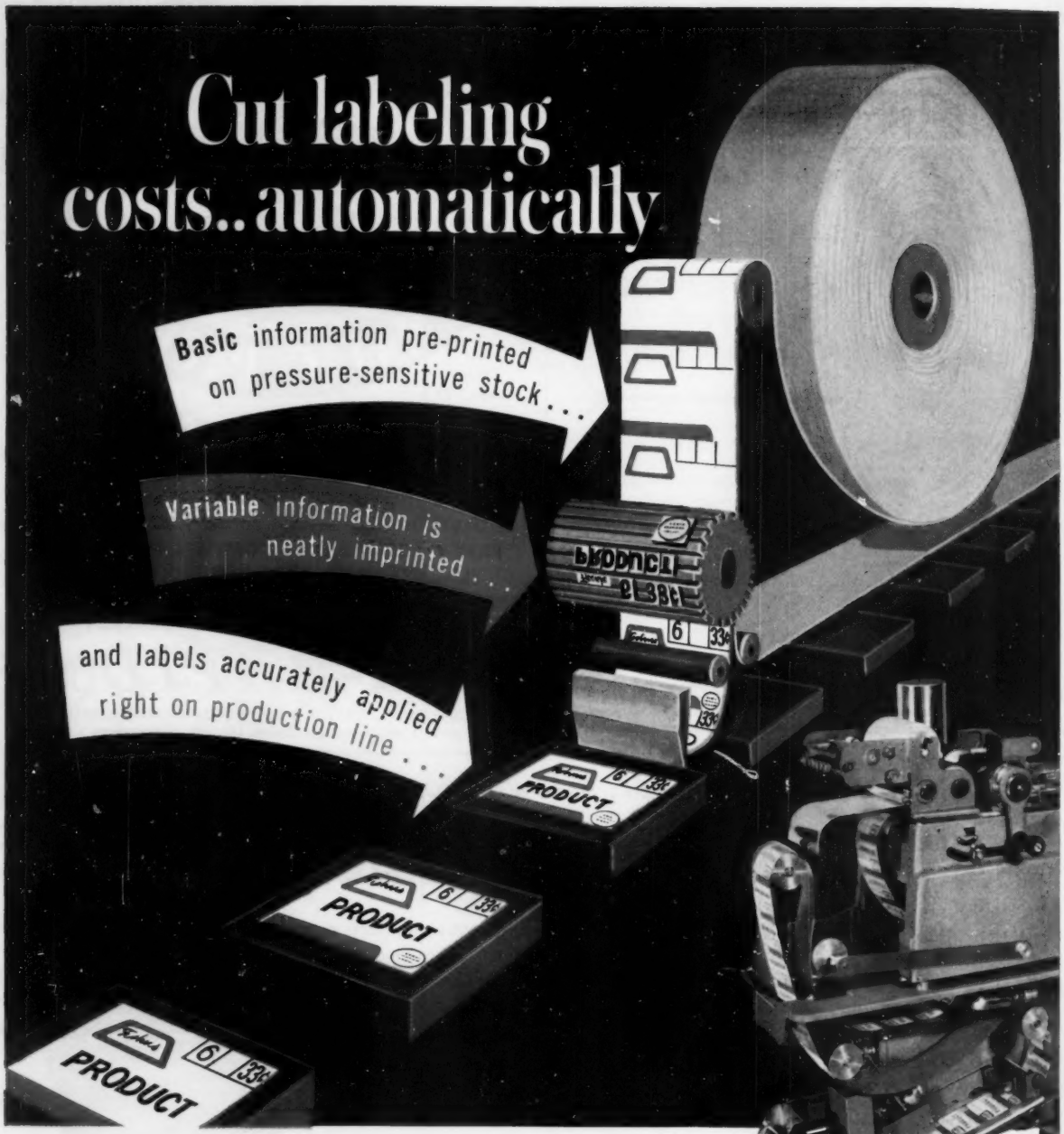
Model BP25. 110 volts or 220 volts, single or three phase. Bedplate: 18" x 30". Air Cylinder: 4½" bore, delivers 1650 lbs. pressure at 100 PSI input. Daylight between upper & lower platen —7".

DO YOU TEAR-SEAL ACETATE? Here's the machine that can seal and trim the package in one operation—*any* size, *any* form. Model 120-SP15. Output 1.2 KW Input 190/240 volts. 15 amps, single phase. 50/60 cycles. Bedplate. 12" x 18". Upper plate: 6" x 10". Air cylinder delivers 625 lbs. at 125 PSI input. Daylight between upper & lower platen —5½". Investigate our complete line of heat sealing equipment.



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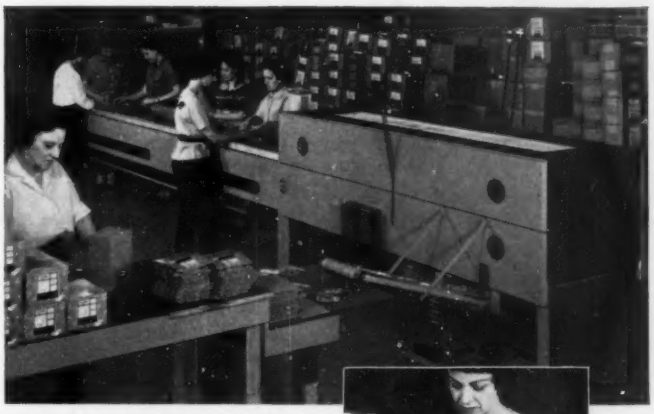
BLIST-O-MATIC

Automatic BLISTER PACKAGING-SEALING

YES...THE PRACTICAL AUTOMATIC MACHINE for Blister Packaging is here at last . . . developed by engineers who have been intimately associated with production and use of back-up cards for Blister Packaging ...and who *know* the problems and needs in this field.

Relatively simple but rugged construction ...smooth *continuous motion* operation... readily accessible parts throughout... ease of change-over of Blisters and Cards... much faster production with no increase in labor... these are built into BLIST-O-MATIC. Check these basic features of the machine:

1. Smooth CONTINUOUS MOTION operation ... no stop-and-go stuttering
2. Fully automatic Card feeding
3. Standard model handles Cards from 2½" x 3½" to 8½" x 11"
4. Handles Blisters up to maximum depths
5. Will handle full line of sizes . . . with changeover time of only ½ hour or less
6. Simplicity of construction means easy maintenance . . . with your own plant people
7. Produces finished Blister Packages at 3000 to 8000 or more per hour . . . *or as fast as Blisters can be loaded with merchandise* (automatic loading is possible with many products)
3. Automatically ejects finished packages
9. Gives accurate Blister-Card registration, and positive, sure seal of Blister to Card
10. Conveyor length at your discretion . . . plenty of room for any number of product loaders



Any number of loading stations may be provided for, with ample working room...Machine automatically discharges completed, firmly sealed packages to packing table.



Card feed and Blister sealing are fully automatic.



Even with this difficult pack for Masonite Corp. Peg-board hardware, speeds up to 35 or more packages per minute are obtained.

• WRITE TODAY FOR DESCRIPTIVE FOLDER, FULL DETAILS

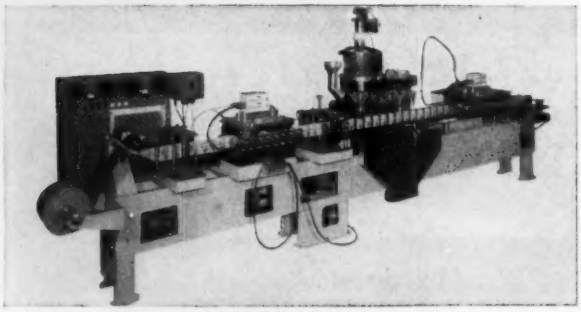
Wirth-Rhodes Corp.

★ *packaging machinery*

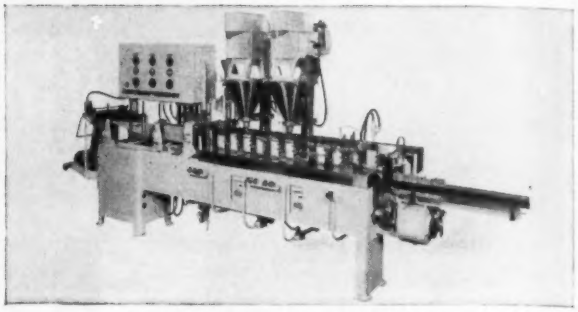
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Flexible packaging for maximum production economy

by Bartelt



BARTELT CONTINUOUS MOTION PACKAGER



BARTELT INTERMITTENT MOTION PACKAGER

Horizontal work flow in the forming, filling and sealing of flexible pouches has improved packaging of many types of products the world over where producers rely on Bartelt Automatic Packaging Machinery.

NEW MACHINE FOR HIGH SPEED FLEXIBLE PACKAGING—To its established line of packaging equipment, Bartelt has added the Continuous Motion Packager . . . also utilizing this proven horizontal work flow principle . . . to produce up to 500 pouches per minute. This provides maximum production economy for the large volume producer. Even at these high speeds the Bartelt Continuous Motion Packager provides superior flexible packaging.

Attainment of these high production rates was accomplished through major engineering innovations in which mechanisms for pouch sealing, cutoff, and filling operate while moving with the work flow. Heat sealers—particularly efficient on this equipment—are capable of up to ½ second dwell time, using relatively low temperatures for optimum sealing.

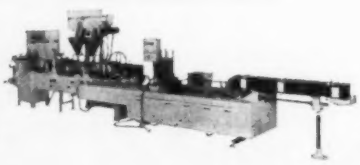
Like all Bartelt Machinery, the Continuous Motion Packager is custom designed to best meet the particular needs of the application . . . and yet is adaptable to changing market requirements.

INTERMITTENT MOTION FOR MAXIMUM VERSATILITY—For moderate to high speed production rates—30 to 300 pouches per minute—the versatility of Bartelt Automatic Packaging Machines using intermittent motion and horizontal work flow is unmatched. Because the functions of forming, filling and sealing are accomplished while the web material is momentarily stationary, there is ample opportunity for substantial conversion of the equipment by only minor adjustments to meet changing packaging requirements.

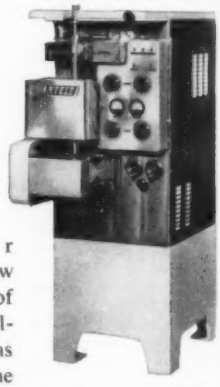
Versatility is assured by the availability of several stations for the application of special tooling: cooling bars, perforating blades, partition seal bars, top fold mechanisms, tear string and saddle label applicators, and die cutting tools, as well as special filling devices.

Top sealing also takes place in a position of its own, well removed from the filling operation to avoid seal contamination. The preceding stations are free for pouch closing operations so that the pouch is presented flat and ready for an undistorted top seal.

A PACKAGING PRODUCTION LINE for integrated production from raw materials to finished carton is available by the addition to the pouch packaging machine of a Bartelt Cartoning Unit using either intermittent or continuous motion operation. Driven and synchronized with the packager, the cartoner inserts from one to thirty-two pouches into a carton, and glues or tucks the carton flaps. A natural for specialty packages, the Bartelt Cartoning Unit can also handle the insertion of coupons, recipe booklets, aluminum cooking pans, cans, jars, or pouches of accessory products.



THE VERSATILE BARTELT AUTOMATIC FILLER, with its capacity to be interchangeably tooled for the fast accurate filling of powders, granulars, liquids or pastes, is used with most Bartelt Packaging Machines. However, when special filling provisions are required, practically any type of filling device can be used. The Bartelt Filler is also available separately as a stand or bench model.



NEW UNIT FOR PILLOW TYPE POUCHES For products which are better adapted to pillow type pouches of superior quality, Bartelt has added to its line the new Bartelt Vertical Packager. This compact, efficient unit provides a new level of production efficiency and quality in vertical operation. The Bartelt Vertical Packager's single tube speed is 40 to 100 per minute. Changing from one package size to another is a simple 15 minute operation. Sure seals at high production speeds are assured, and the machine is ruggedly designed for years of high quality performance.

ILLUSTRATED BROCHURES with complete details are available on request. Whatever your packaging requirements, Bartelt will be happy to consult with you, without obligation.

Write: *Bartelt Engineering Company, Inc., 1904 Harrison Ave., Rockford, Illinois.*

Advertisers' Index by Subject Matter

Accessory And Specialty Equipment

Listings do not necessarily cover entire lines of advertisers or all producers in each category. See also the listing in the Buyers' Directory under the category for which information is sought, especially listings marked with bullets. Also consult Advertisers' Index in the last pages of the Encyclopedia.

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SECTION 13

ACCESSORY AND SPECIALTY EQUIPMENT

Package-marking equipment

by Joseph Mastracchio*

The dynamics of modern packaging have had the inevitable result: literally billions of printed packages are presented yearly to the public.

These packages, designed to attract and inform and to contain both consumer and industrial products, are fed through hundreds of distribution channels—each with its own peculiarity, demands and need for control.

This control is being satisfied by coding and imprinting operations and by the equipment which imprints supplementary information such as code dates, pre-pricing, control numbers, inventory numbers and symbols, special deal information, and the like.

In recent years, management men have become more and more aware of the importance of coding and marking and have taken a new look at the time-honored methods. Increasing demands of distribution have forced management men to pay more attention to the importance of coding due to the necessity of controlling their production, sales distribution and rotation (shelf life).

Management men are discovering that many of the accepted methods of the past no longer belong in the flow of high-speed packaging and are turning more and more to quality-engineered imprinting equipment.

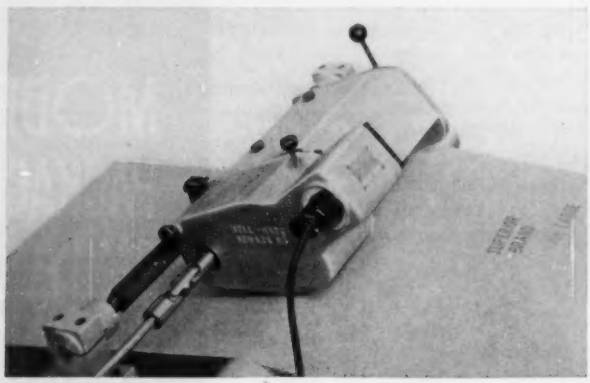
The coding and imprinting industry has responded to this demand and now one can procure equipment for the most complicated packaging line.

Manual marking through the use of stencils, rubber stamps and labels still plays an important part in total packaging. However, the trend is toward in-line equipment capable of imprinting clear, sharp images at highest production speeds. Today there are available imprinting devices and marking equipment which are easily maintained, are reliable, and produce imprints rivaling the quality of the preprinted package. Interchangeable type and new inking systems have provided new versatility in this equipment. Additionally, the use of electric clutches, "starting arms" and other control devices has overcome old registration problems and increased the accuracy of equipment.

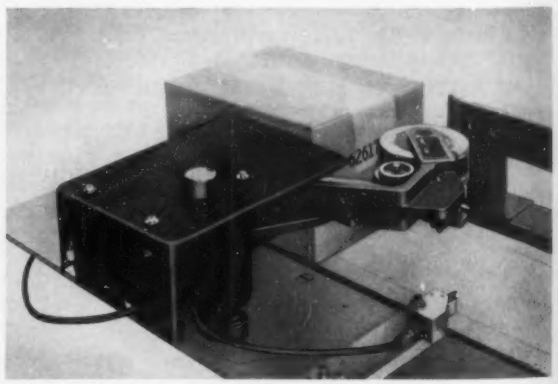
*President, Bell-Mark Corp., Newark, N. J.

Basic types of machines

Conveyor attachments. There are available today several types of coders used as conveyor attachments to print individual units such as corrugated boxes, bottles, flexible packages, etc. The most popular are the two- and three-roller units. The two-roller unit consists of a plate cylinder which accommodates rubber type (interchangeable) and a felt inking roller. The ink is transferred to the type and imprints directly on the package. Where precise quality imprinting is required, an intermediate roller frequently is included. These coders



FLEXOGRAPHIC imprinter, electrically driven, does high-quality supplementary printing on web-fed materials or on units. Gear and clutch mechanism is completely enclosed; speed geared to speed of machine. Quick changeover. (*Bell-Mark Corp. photo*)

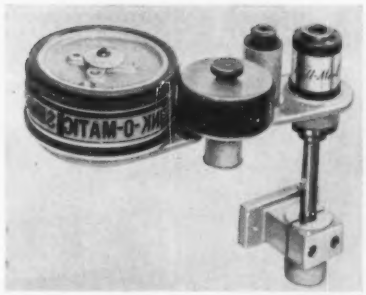


TWO MARKINGS in a single pass. Attachment for conveyors and case sealers automatically rolls the legend across the side surface of the case, then applies the same or a different legend on the rear surface. (*Adolph Gottscho photo*)

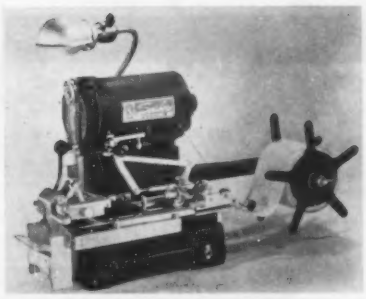
generally are actuated by friction contact with the product being conveyed. Refinements to this type of equipment include the use of a starting arm which assures a registered mark on the product. The two- and three-roller units are used primarily for imprinting code marks, legends or other identification marks.

Printing attachments. Most models of production-line imprinters are designed to become an integral part of the packaging machine. Incorporating the imprinter into the packaging machine (to print units or web material) eliminates secondary handling of products and reduces imprinting cost. Usually employing the flexographic ink system and utilizing fast-drying inks, these units have found wide use in various fields where high speed is a requirement. Additionally, imprinters allow the packager to imprint on polyethylene, aluminum foil, cellophane, glass, metal and other hard-to-print surfaces. Registration, often a critical factor, is controlled through the use of electrically operated, single-revolution clutch devices erroneously thought by many people to be used solely for small imprints. Actually, this type of unit is available with a printing surface as wide as 42 inches.

Miscellaneous imprinting devices. Although coding and imprinting units are commonly used for most imprinting operations, there are a myriad of other high-speed devices available to add supplementary information. These include embossed engraving wheels for imprinting cylinders, high-speed tag markers, label imprinters, perforators, and miniature attachments which will apply code information to the smallest pill.



NEW porelon inking roller supplies ink in a cartridge-type system, replaced when ink is exhausted. Used primarily for porous materials. (*Bell-Mark Corp. photo*)



VERSATILE marker automatically imprints, counts, cuts and stacks various sizes of tickets, tags or labels up to 4- by 5-in. from roll form. (*Soabar Co. photo*)

Operation and maintenance

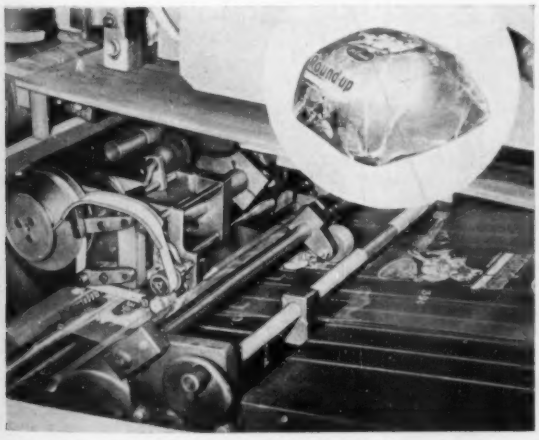
Demands for maintenance-free equipment required development of highly engineered imprinting equipment. The imprinting industry has responded by producing more durable equipment such as: (a) new flexographic-type printers designed to give positive registered imprints on the package; (b) miniature coders containing friction-operated clutch devices for registered imprinting where a power drive is not available; (c) new printers utilizing brass-backed dies with special locking devices for quick type changes; (d) printers using roll-leaf material to imprint on material such as cellophane, polyethylene, polyester, wax surfaces, etc.; (e) compact units which cut, fold, punch and imprint overtags for attachment to film bags; (f) electronic equipment, used in controlling inventory by means of a print-punch tag which is read out to an electrical system. Innovations also have been added to the available line —such as the porelon microporous inking roller discussed later.

Service, always an important factor, also has become mandatory on the part of producers of coding and imprinting equipment. Today, special installation and engineering assistance is provided by most manufacturers of coding and imprinting equipment. Further, most producers will provide engineering assistance in selecting the correct printing equipment for use in production-line flow.

New developments

Several new developments in the field of coding and imprinting are being made available to manufacturers.

The most impressive advancement



DRY PROCESS ribbon-leaf imprinter makes rubproof, smearproof imprints on any flexible material. It is designed to be attached to wrapping, pouch, sachet and bag machines. (*Adolph Gottscho photo*)



BOTH fixed copy, such as company name and trademark, and variable copy, such as quantity, date code, etc., imprinted in same operation. Plates for variable data quickly replaced. There is a wide color range of inks, for most materials. (*Markem Machine Co. photo*)

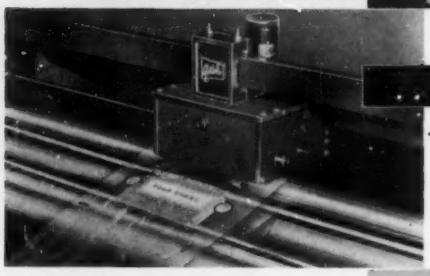
Gottscho automatic package imprinters

for imprinting anything on any package

. . . in the cube



▲ ROLACODER conveyor attachment

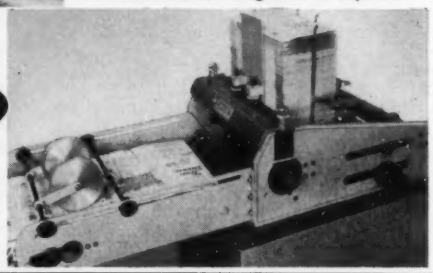


. . . in the web

◀ ROLAPRINTER® wrapping machine attachment

. . . in the flat

▼ CARTONCODA® magazine-fed imprinter



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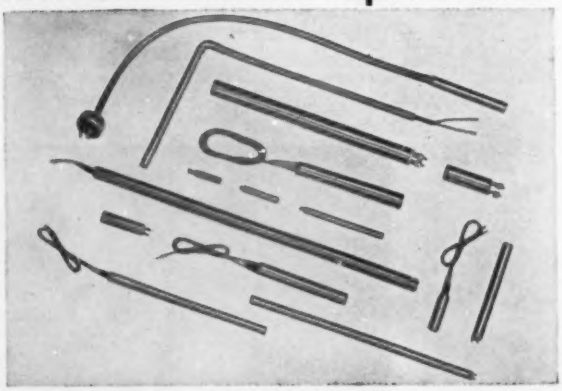


Illustration shows a few of the many Cartridge Heating Units available from Ogden. All popular sizes in stock for immediate delivery. Wherever even, concentrated heat is desired there is an Ogden unit exactly suited to meet your needs. Speed up your package sealing and other operations requiring heating elements . . . with Ogden. Write for new catalog.

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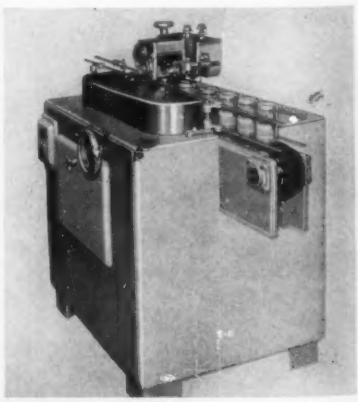
in this field during 1961 was the extended use of the porelon microporous inking systems. This new, revolutionary material has been widely accepted throughout the packaging industry because of its elimination of the standard liquid inks used with felt-type systems. The porelon roller is manufactured with its own ink supply which acts as a cartridge-type system, providing several weeks of continuous operation without need for change. Upon exhaustion, the roller is quickly replaced with a fresh porelon unit. A further advantage of the porelon inking system is that older coding and marking devices can be converted quickly to its use.

The emergence of flexible packaging, generally film, sealed with an overtag has brought on the development of new high-speed printing equipment which in one operation imprints the tag, cuts it to size, and folds it for application.

The need for miniature equipment to imprint supplementary information on cartons, labels and containers in "tight fit" applications has been filled through the production of new miniature coding units. This trend in miniaturization of coding equipment has allowed many manufacturers to install in-line equipment in limited space.

The development of high-speed bundling equipment has brought on the requirement for large imprinting units which are used as an integral part of the packaging operation. Rubber type, easily interchangeable, reduces the need for stocking multiple quantities of preprinted overwrap stock.

Other such developments include



TOP AND BOTTOM of containers simultaneously imprinted during high-speed operations; or either top or bottom. Imprints variety of containers, up to 400 a minute. (*Cozzone Marking Co. photo*)

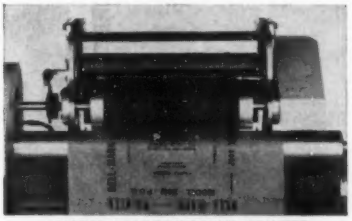
IF IT WEREN'T FOR
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THESE PRODUCTION LINES WOULD BE OPERATING AT LESS THAN PEAK EFFICIENCY

Bell-Mark Corp. marking, coding and imprinting equipment is specifically designed for use on most commercial packaging line equipment. Ranging in price from seventy-five dollars to three thousand dollars, each unit is engineered to the need of the particular marking or imprinting operation. Bell-Mark equipment is known for its dependable operation and minimum maintenance requirements. Some of the more popular units are illustrated below.



MODEL 614 ELECTRA-PRINTA

Attaches to package, wrapping or bag making machines. Single revolution clutch assures precise registration on various size packages. Widely used in meat, food, stationery, cosmetic industries.



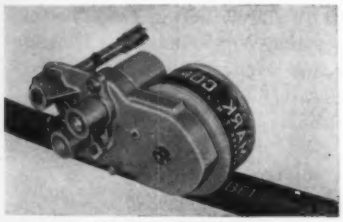
MODEL 2412 PRINTAWEB PRINTER

Installed on wrapping and bundling machines. Used for registered or random printing on web material. Eliminates need for stocking various print copy material.



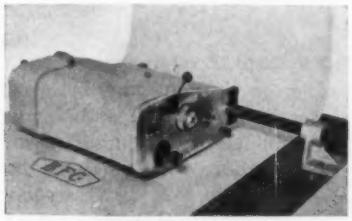
SERIES '19' INK-O-MATIC CODER

Used for imprinting codes, dates, messages on packages. Mounted on conveyors, packaging machines, case sealers, etc. Utilizes Porelon microporus plastic inking system.



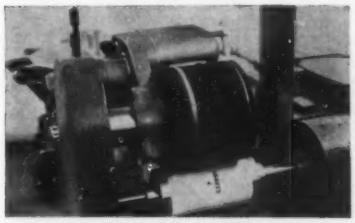
MODEL 3073 PRINTER

Developed specifically for the rubber industry. Prints identification information on camel back and tread rubber. Installed on conveyor line.



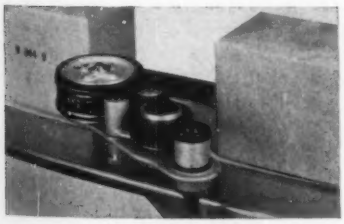
MODEL 1226 PRINTER

Double frame construction. Capable of printing up to 12" face width. Adaptable to industrial processing equipment and package machinery. Can be used for random, continuous marking.



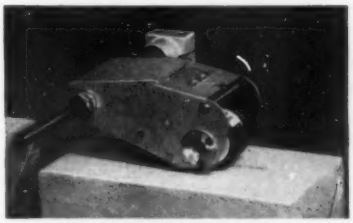
BELL-FLEX PRINTER

Installed on most packaging machines. Variable circumference cylinder allows registered printing on various cut-off lengths.



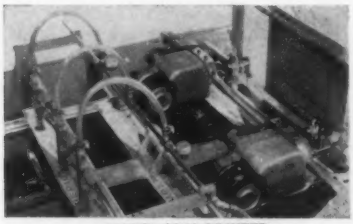
SERIES '20' CODER

Successfully used for code marking or otherwise identifying packages. Can be mounted on most case sealers, conveyors and package machines.



MINI-CODER SERIES '600'

Installed on labelers, cartoners, case sealers, and all types of conveying equipment. Used for imprinting top, bottom or sides of product.



MODEL 1240 PRINTER

Widely used on cartoners and unit packaging machines. Used for identifying product being packaged or adding supplementary information to preprinted package.

Bell-Mark

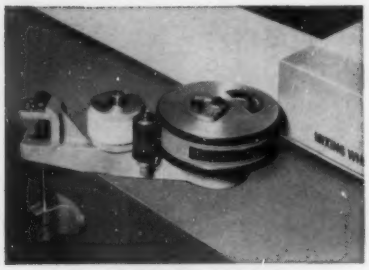
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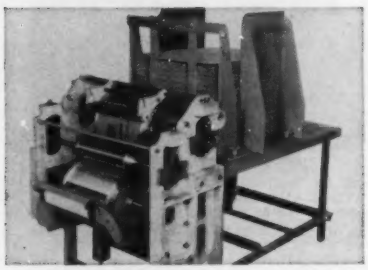
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Manufacturers of coding and printing equipment, automatic marking machinery.

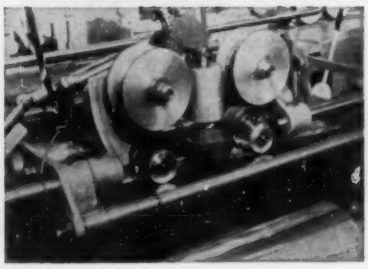
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#7 AUTOPRINTER® automatically imprints one or both sides of cartons and multi wall bags at speeds up to 3000 per hour. Prints clear impressions on any flat, absorbent surface regardless of minor surface variations.



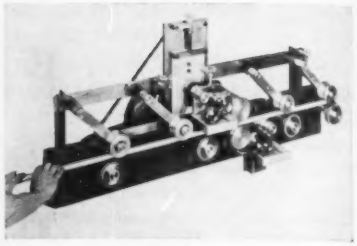
RAINBOW CODER® offers you a wide color range in sharp, clear, controlled impressions on any surface that will accept hot roll leaf imprinting. Designed to be synchronized with speed of the packaging machine, it requires no operator, no ink, no makeready and very little maintenance.

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TUBES AND RODS, rigid or semirigid, marked on top and bottom. Unit handles ⅜- to 3-in. tubing; adjustable to other sizes. (*Industrial Marking Equip. photo*)

the use of the engraved wheel printers designed to imprint plastic and rubber tubing, four-side case printers, top and bottom coders, and special "gang" installations for multiple lines.

On the horizon

Management, production and distribution personnel, having become more conscious of the need for clear and concise imprinting accomplished under high-speed conditions, are looking into new developments or are investigating better use of the existing methods. These include the use of invisible inks for pricing and code information, high-speed units to imprint both top and bottom of containers simultaneously at speeds in excess of 1,500 per minute, use of new inking compounds, both washable and color-fast, and use of magnetic and fluorescent inks, synchronous motor drive, and photo-sensitive and multicolor imprinting. But problems still need to be solved.

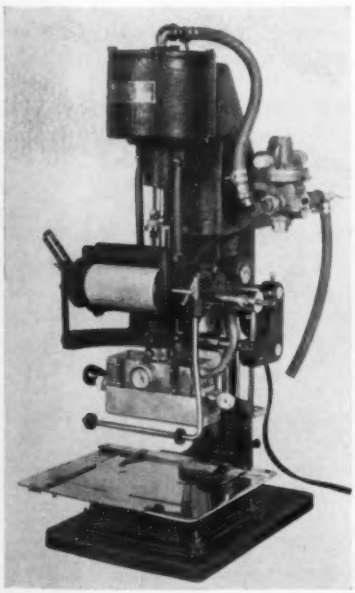
For example, a major problem which exists in marking cans, bottles and smaller containers is the large variation in size and shape. These containers have to be handled with the same equipment, but change of parts and time must be held to a minimum. The marking industry is now developing some revolutionary designs of equipment to handle this intricate operation. And, again, with pouches there is a large variety of sizes and shapes which restricts the use of a standard-size printer. Emerging this year are refinements to the electric-clutch-operated printers which can imprint prices, code dates and special information on all packages regardless of size.

The excessive inventory costs for preprinted stock used in bundling has spurred the development of imprinters which can be mounted on the bundling machine to imprint the

material while in operation. A further advantage is the ability to imprint—almost immediately—special deal data for wholesalers and retailers.

In addition, the imprinting industry is faced with a need for newly formulated inks for specific applications regardless of the type of imprint surface. Surfaces such as corrugated, wax paper, plastic, glass and varnished coatings present individual problems. A wax paper requires an ink with a solvent for penetration of the wax without destroying the wax surface. Each type of plastic requires an ink suitable to its individual characteristics. Glass requires a very fast air-drying ink with adhesive qualities. Again, most manufacturers of coding and imprinting equipment are working hard on new formulations which best suit their own equipment and the packaging-line application.

A final consideration. Government regulations are increasing (see page 32). Regulations such as these require legible imprints and, because of the high cost factor, usually are applied in the flow of production. And, these problems are not confined to legal aspects. Control is used in practically every industry from rubber to textile wherein the complicated make-up of some finished material requires that content information, laundry instructions, washability and other factors be imprinted.



AIR-OPERATED microswitch-activated unit marks prices, similar data on transparent packages. A similar model marks blister packs. (*Ackerman-Gould photo*)

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STAPLING EQUIPMENT

by Sherman L. Smith*

Three aspects of packaging in which stapling plays an important part are carding, bag sealing and shipping.

There are many instances of attaching small items to cards where stapling is the fastest, most practical and most economical method. The staple can be shaped and the pressure controlled so soft or brittle objects are held firmly and without damage. Staples frequently are used in assembling blister packs, either by stapling the blister directly to the card or by fastening together a folded, die-cut card. Staples are widely employed to attach a series of small bags or envelopes to a large card for a dispensing display.

Folded tops of paper bags and cardboard headers on polyethylene bags are fastened with staples—usually the fastest method. Twisted or gathered tops of polyethylene bags often are held by conventional type staples with legs tightly clinched or by staples of the hog ring type. There are manual, foot-operated and motor-driven machines for this purpose.

Probably the most extensive use of industrial stapling today is in the shipping room. Stapling the bottom flaps of corrugated shipping containers is very fast, economical and secure, and it permits the containers to be set up as needed without tying up valuable space with containers made up in advance. There are also several types of equipment for stapling the tops. The use of a stapler with a sealing blade inserted under the box flaps—now employed mostly on very large boxes—has given way to self-closing staples and staples closed by penetrating and retractable clinchers.

The use of wide-crown staples for top sealing has developed extensively during the past few years. Usually four such staples astride the seam will do the work of twelve staples in the conventional pattern. Uniform Freight Classification Rule 41 has approved this staple and this new pattern.

A recent development of the wide crown is the partially preformed staple. The shoulders of this staple are only slightly turned to facilitate proper forming in the stapling machine. The result is a strip of staples which can be nested for magazine feeding or can be coiled for continuous feed of up to 4,000 staples.

One reason for the rapid increase in the use of wide-crown staples has been the development of more machines to apply them.

For box bottoming there are post machines for this staple, and several hand-operated and air-operated wide-crown staplers do top sealing.

Pointed blade stapling pliers are used on the smaller sizes of containers. The blade is inserted at the fold and thrust under the flaps to permit stapling well in from the edge.

When both the tops and the bottoms of shipping containers are stapled, they become almost completely pilferproof. It is virtually impossible to remove the staples and reseal the containers without leaving tell-tale evidence of tampering.

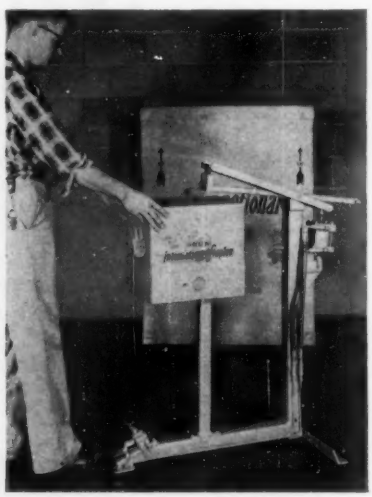
*Director of Advertising, Bostitch, East Greenwich, Rhode Island.



TABLE STAPLER fastens elastic loops to card to hold fishing lures in display position. (*Bostitch photo*)



AIR-DRIVEN portable stapler seals carton tops with wide-crown staples. Seals filled containers entirely from outside. (*Bostitch photo*)



CARTON BOTTOMS stapled by air-powered foot operation, freeing both hands. Staples sizes ½, ⅝, ¾ inches. (*International Staple photo*)



COIL-FED portable stitcher staples to ⅜-in. thickness in paper, wood, metal. Staple cost—3 to 5 cents a thousand. (*General Staple photo*)

Stapling tackers which make an outward clinch have found wide acceptance for attaching labels, bills of lading and other documents to corrugated containers. The staple is applied from outside and the legs are curled outward to form a clinch inside the material. This is a clean and very rapid method.

Stapling is admirably suited to fastening flexible corrugated wrappings, either regular or irregular in shape. The blade of a stapling plier is inserted under the folds of the package and a squeeze of the operating lever does the job.

Machines for stapling range from vest-pocket size to large automatic stitchers that weigh over a ton and a half and may be hand operated, foot operated, air operated or electrically powered. The smaller machines use preformed staples while most of the larger machines form their own staples from a coil of wire and are called wire stitchers.

The hand-operated machines are especially suited to layouts where it is desirable to staple the cartons in various locations in the plant or in the shipping department. When access to an air line permits use of an air-driven machine, operator fatigue is virtually eliminated and greater speed usually results, although hand operators have fastened 144 cartons in 22 min., with 20 staples in each carton.

Motorized machines usually are employed in conjunction with a conveyor line which delivers the containers to the work table at proper height.

An important factor in selecting a machine for top sealing is uniformity of carton sizes. Obviously, portable machines can be lifted from one carton to another regardless of size; but, when a motorized machine is used, it is desirable to seal cartons in runs of uniform height to avoid frequent adjustments of the distance between work table and stapling head.

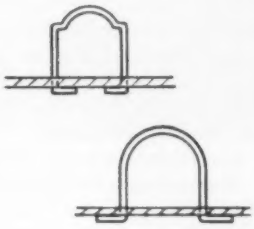
Because of the extent of the possible uses of stapling, a fabulous variety of stapling machines has been developed. One manufacturer alone lists some 800 standard types. Sometimes the customer is able to specify the machine he needs for the job at hand. Usually, however, he finds it advisable to call in the qualified representative of a reliable manufacturer and discuss his problem so he can best fill his needs as to output and investment and can do an adequate fastening job.

Staples and clinches—basic styles

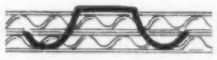
Wrap-around staple. For bag closure. Formed round or elliptical from $\frac{3}{32}$ in. to 1 in. or more in diameter. Legs can be clinched to firmly grip neck of bag without penetrating or can be turned in to prevent slide-off.



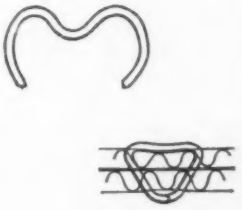
Shaped-crown staple. Used extensively for carding merchandise. Crowns shaped in variety of ways to fit object. Fastens fragile materials such as glass tubes and bottles. Legs can be turned inward or outward. Outward clinch often preferable where nature of object does not permit legs to be turned inward and compressed.



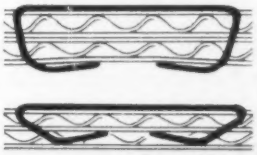
Thrcw-out clinch. Labeling or tagging corrugated shipping containers. Legs are curled as they leave the stapler, clinching inside work. Fastening accomplished entirely from one side without clincher.



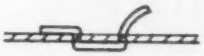
Self-closing staple. Seals filled corrugated containers completely from the outside. Crown flattened as staple is driven, causing legs to turn inward. No clincher. Leaves no clincher holes in box. Choice for blind or through clinch.



Wide-crown staple. Bottom and top sealing. Wide-crown (1¼ in.) staple driven by machine with retractable clincher arms that penetrate work and guide legs into position. Three or four wide-crown staples seal container that would require 12 to 16 smaller-size staples.



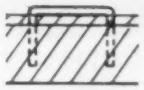
Hook staple. Display carding applications. One leg clinched to hold; other leg slightly curved, not clinched, providing a hook for attachments.



Fore-and-aft clinch. Fastens extra-thick multiwall corrugated—to approximately 1-in. thickness—without crushing board. Applied by wire stitchers. Round wire only.



Tacking. Labeling or tagging wooden crates; fastening protective excelsior pads or similar material inside crates. Staples are driven into wood or other materials in the manner of two-pointed tacks.



Equipment for applying tape

Over the years, there has been a general improvement in both light- and heavy-duty types of dispensers. Lighter materials, without sacrifice of strength, have been adopted. Electrically driven dispensers are being used to some extent, but this type of equipment is limited to operations which are continuous and heavy.

Moistening features. The safety of a gummed-tape seal depends on the permanency of the grip or bond between the kraft sealing tape and the container surface. (See packaging tapes chart, Section 5.) Therefore:

1. The glue must be of sufficiently good grade and suited to the use.

2. By the addition of moisture, the glue must be conditioned to the proper consistency for quick, deep penetration into the dry, porous box surface, where it hardens to form minute hooks anchoring the tape permanently to the kraft liner. If too little water is added, it does not penetrate the glue and the resulting weak seal breaks open in a few hours. However, too much water slows up application, as the tape requires longer rubbing to set. When the excess water dries, the glue solution left is of insufficient strength to stick firmly.

Failure of gummed tape on shipping containers results from faulty application more often than from defects in the tape. An advantage of automatic equipment is that practically all elements of chance are eliminated in moistening the gummed tape.

To meet special conditions in cold shipping or refrigerating rooms, electric heating units were devised to keep the water in moistening tanks at proper temperature.

Measuring features. Less essential than the moistening features but still an important advantage of many modern machines is their tape-measuring function. Visible measuring gauges and set stops for standard lengths are two devices used.

Equipment for the small package is now widespread. The small package includes boxes, paper bags and ordinary wrapping paper, particularly for packaging retail merchandise which is wrapped for carrying home.

Pressure-sensitive tape dispensers. Unlike gummed-tape dispensers, machines for use with the newer pressure-sensitive or tacky tapes are required merely to measure, dispense and in some cases automatically cut predetermined lengths of tape.

But development of efficient dispensing machines was even more essential for pressure-sensitive tape than for gummed tape. Water-resistant cellulose tape costs roughly 28 times as much as the 60-lb. kraft used for gummed tape. For this reason the most important part of a dispensing machine for tacky tape is its measuring feature. Proper dispensing of short lengths can halve tape consumption.

The varied uses of pressure-sensitive tape have determined the different kinds of dispensing machines necessary for its efficient and economical application. Some are designed for factory production and may be set for predetermined lengths ranging from ¾ to 1½ inches. Others are designed for use in retail stores.

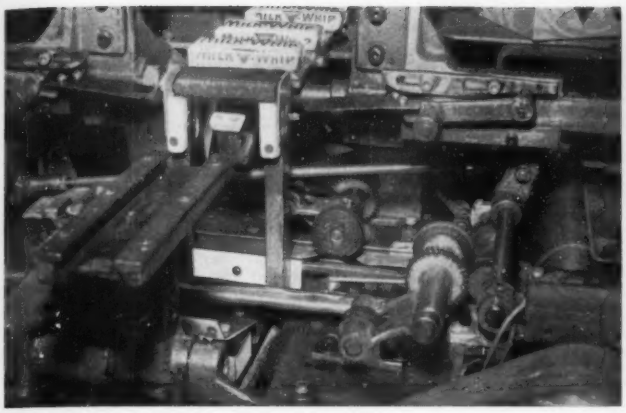
Currently there is an important trend toward the use of automatic equipment developed to do many new types of tape-applying chores Machines have been designed that band two cans or cartons together; that apply a patch of tape over pre-opened apertures in cleansing-powder canisters; that girth-strap large bundles; that apply tape closures to film bags and to cases, and that strip package component parts on a reel of tape for automatic feed into high-speed machines on assembly production lines. (See chart on p. 199.)



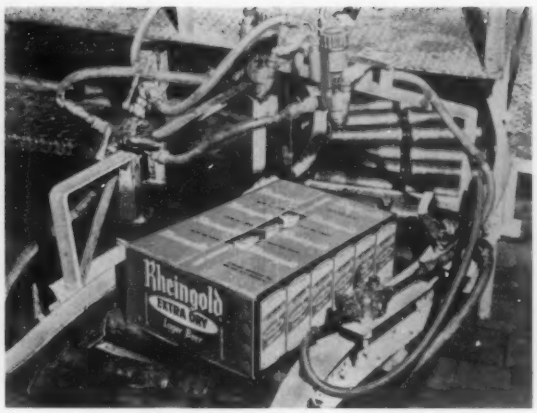
DEAL PACKAGING. This unit applies strips of tape on two sides. It is used to combine two packages for deals or special promotions or to provide easier handling. (*Minnesota Mining & Manufacturing photo*)



ELECTRONIC tape dispenser delivers up to 60 inches, cuts various tapes with no adjustment. (*Diagraph-Bradley photo*)



STICKING PROBLEM is solved with fluorocarbon parts, including white guides, backstop, tuckers and elevators, for this overwrapper that handles chocolate candy bars at the plant of the Tom Huston Peanut Co., in Columbus, Ga. (*Du Pont photo*)



SLIPPING PROBLEM is solved. Spraying system coats top of slick-finished beer cases with resin dispersion which dries to colorless skid-resistant film. Case trips switch to start and stop sprayer. (*DeVilbiss Co. photo*)

Auxiliary packaging line equipment

Plus performance on today's modern, efficient packaging lines quite frequently depends on auxiliary devices and special facilities to provide the inspection, control and safety factors that make high speeds, sustained production and uniform quality control practical.

The subject of accessory equipment for packaging lines is extremely broad. Literature dealing with the over-all subject is practically nonexistent. Many of the commercial devices and facilities are designed primarily for use by converters and much of the equipment that has specific application on the packaging line either is made to order or else is homemade. Also, many manufacturers of equipment such as pumps, gears, brakes, switches, signals, motors, controls, totalizers and the like concentrate on over-all production line problems.

Conditioning devices

An important type of equipment for the packaging line includes the devices used to maintain constant humidity and temperature. The demands vary from plant to plant and from product to product, but many lines today depend on uniform temperature and humidity for avoidance of jam-ups in handling certain types of products—sticky products for example—and also for smooth handling of the container.

Non-stick coatings and tapes are extremely important in a range of packaging operations. These coatings and tapes employ several materials including tetrafluoroethylene and silicones. The purpose is (1) to facilitate the handling of sticky products, (2) to prevent build-up of adhesives on parts of packaging machines, and not only maintain efficient performance but also eliminate costly and time-consuming clean-up, and (3) to expedite heat sealing especially of plastics where heating is critical. Several custom coaters and tape manufacturers specialize in anti-stick accessories.

Inspection and control

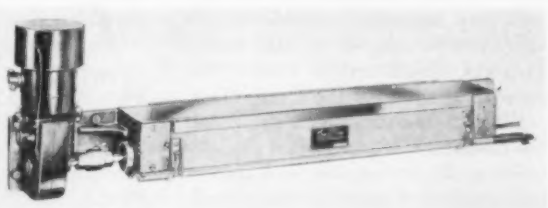
A multitude of inspection and control devices speed today's automatic packaging—maintaining constant levels of filling hoppers or accurately positioning containers or components; scanning labels; picking off loose caps; triggering special warning systems—for it is axiomatic that, when speeds are increased, the problems of regulation and inspection mount accordingly.

Jigs for setting controls on filling or other equipment have been found valuable on the high-speed, fully mechanized line, since faster speeds and more exacting requirements make it necessary to reinforce human judgment with precision aids.

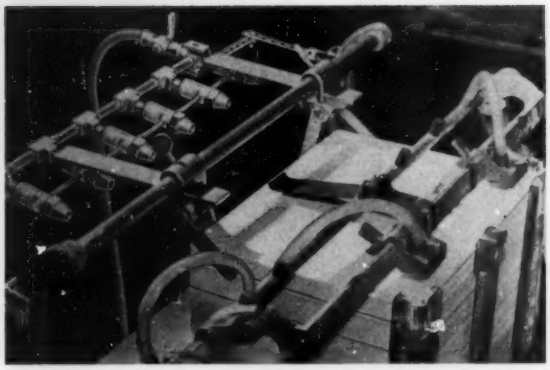
A homemade device solved one packager's problem of removing moisture from jars prior to labeling. An endless belt faced with wet-strength paper blots the moisture. In fact, examples of the benefits derived from home-engineered devices are to be found in nearly every plant where plus performance is demanded.

Registration controls

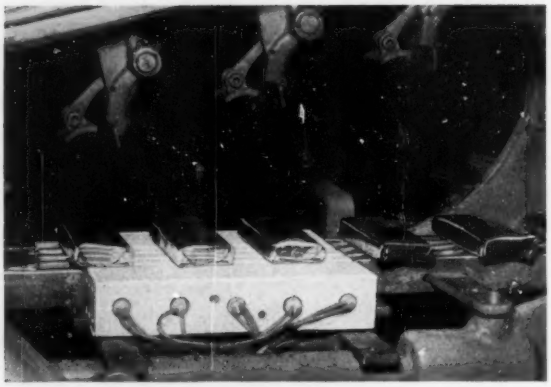
In converting printed packaging materials such as glassine, cellophane, plastics and foils into individual sheets for wrapping, packaging and bag making, a means must be used to assure that each sheet is punched, perforated or cut off in correct relationship to the



INK OFFSET problem is solved. Dry powder applicator, attached to printing press or converting equipment, puts tiny spacers between sheet and winds; separates wet ink from surface above. (*Oxy-Dry Sprayer photo*)



AIR BLOWER static eliminator. Ionizing air nozzles with static eliminators separate and neutralize sheets of coated or uncoated paper or plastic which are being fed from stacks. (*Simco Co. photo*)



EXPERIMENTAL USE: block of fluorocarbon with imbedded heating elements used to expedite heat sealing. The block is designed to avoid ink smear that occurs when cast-iron heat sealers are used to seal two-color wrappers for candy bars. (*Du Pont photo*)

printed design on the web. Where a printed mark is not available, it is often possible to make use of the leading edge of the web to interrupt a photoelectric beam.

There are two types of photoelectric controls in general use.

1. *One-way cut-off register control* is used where the accumulation of error in register is always in one direction. Hence, the control is required to correct in only one direction, the web being consistently overfed or underfed with respect to the cutter.

One-way cut-off is applicable where web speed does not exceed 300 fpm. Moreover, it is designed to correct fixed errors only, while the two-way takes care of erratic errors.

2. *Two-way cut-off register control* is applied where errors in register can be in either direction—that is, the web may be either retarded or advanced with respect to the cutter. Two-way cut-off register control will correct for either of these conditions.

When two-way register is employed, the machine is set up so that the web is fed at the correct rate with respect to the cutter. A photoelectric scanner "observes" register marks or printed patterns on the web and produces signals which indicate the web position. A rotary photoelectric selector switch is geared to the cutter and produces signals which indicate the position of the cutter.

These two signals are fed to the control panel, which compares them to determine the amount and direction of any required correction. If a correction is necessary, the panel operates a correction motor which rotates in the direction necessary to register, or synchronize, the web and cutter with respect to each other. This correction is usually made through a differential gear connecting the machine-feed and correction motor.

Photoelectric registration control has had to adapt itself within commercial limits for production with materials such as polyethylene that have presented new problems.

The best results in the controlling of preprinted polyethylene webs have been obtained with the use of two-way correction. It is a material that is prone to stretch—more so than other converter's materials. Unwind and rewind at the printing source, forming, perforating and other operations in general will each have its effect on the tension of the material.

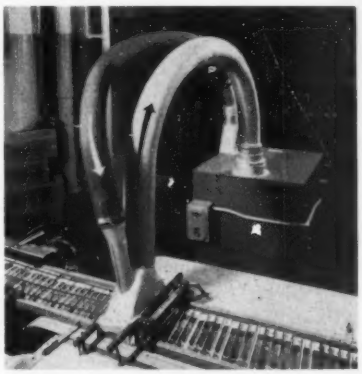
Static eliminators

Disrupted production schedules in packaging often can be attributed to static electricity, particularly where plastic films such as acetate, polyethylene, saran, Pliofilm, polyester film or vinyl are being used. Less trouble is encountered with cellophane or paper.

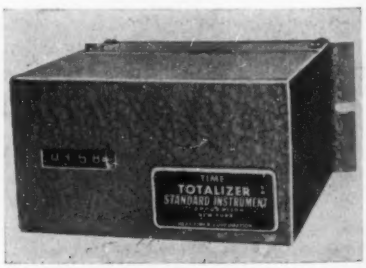
Another static problem involves the product being packaged. Problems with powdered products often are particularly acute.

The principal types of static eliminators include:

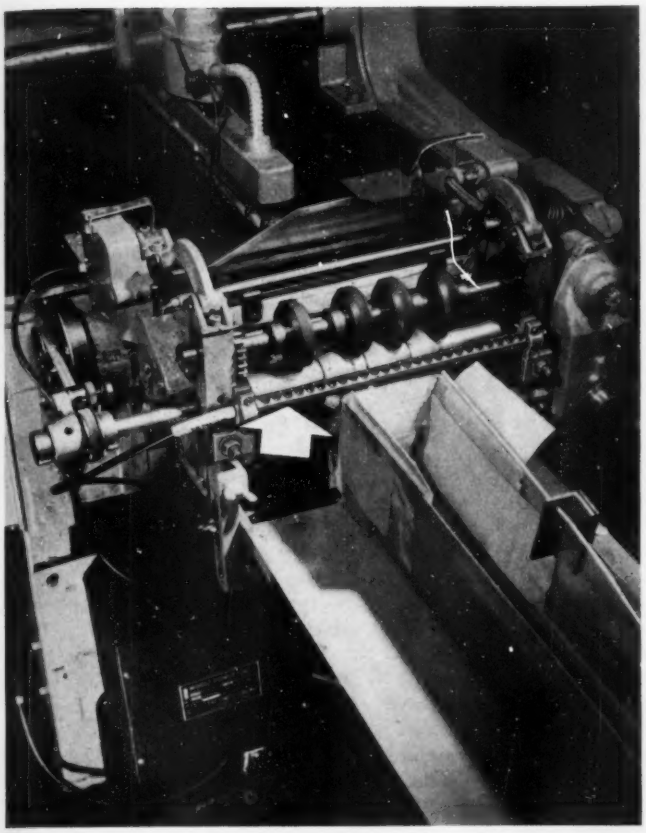
Simple grounding devices. These are the oldest and least expensive form of static eliminators and consist of suitably grounded metallic bristles or points which are applied either very near or touching the material to be discharged. Wire-core tinsel is sometimes used as well as radial brushes of various descriptions. More elaborate and somewhat more efficient devices consist of properly spaced flex-



CARTON CLEANER. As vacuum hose (black arrow) carries waste back to collector cabinet, clean air from blower hose (white arrow) stirs up hidden particles. Here, paper dust and chaff are being removed from Lactona toothbrush cartons. (*Torit Mfg. Co. unit*)



TIME TOTALIZER eliminates need to add time chart figures for up-to-the-minute operating totals. (*Standard Instrument photo*)



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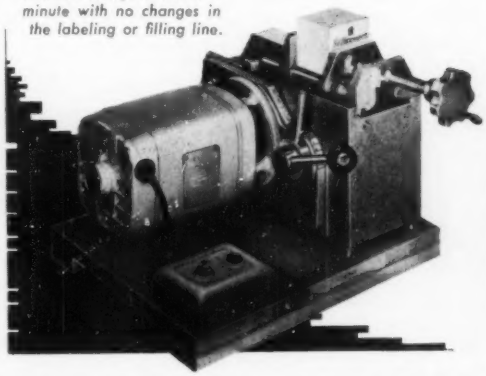
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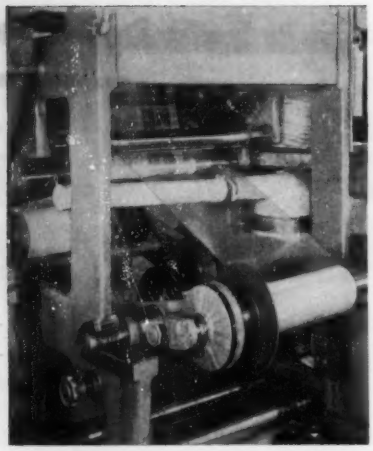
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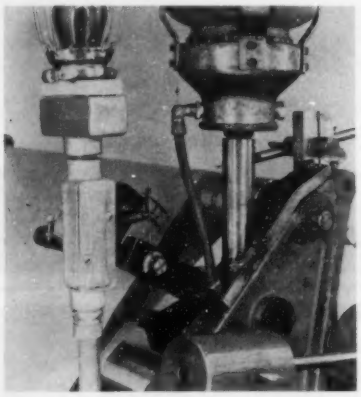
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HUMIDIFIER unit on printing press helps to maintain the proper amount of moisture in cellophane. (*Walton Laboratories photo*)



ELECTRONIC DETECTOR of faulty, unpasted seams flashes warning light when seam of running web is interrupted or is without paste—eliminating need for personal inspection. For paste breaks ⅛ to 12 inches. (*Potdevin Machine Co. photo*)

ible points in a protective mounting.

Electric static eliminators. Among devices for static elimination, this type of apparatus is certainly the most effective and widely used today. It consists of one or more static bars, determined by the specific application, and a power unit which energizes the bars with a high voltage of very low amperage. The static bars can assume a variety of forms, usually having a series of points facing the material to be discharged. They are mounted on the machine so that the material passes the bar at the distance specified by the manufacturer.

The main advantage of this type of eliminator is that it can produce ionization of the air independently of the material to be discharged. It can produce sufficient ionization to do an essentially complete job of neutralization on almost any material.

Although all are perfectly safe, the most efficient static eliminators of the electric type sometimes cause an involuntary recoil when the points of the bar are touched. If this is objectionable and the operator must work where he will touch the points, the power unit can be connected to go on and off automatically with the machine. "Shockless" types are also available in which the current at the points of the static bar is reduced to such an extent that the points may be touched without any sensation of shock.

The electric static bars usually can be made in any length desired. Cross-sectional shape and size vary among manufacturers from several inches in diameter down to 5/16 inch.

The main disadvantage of the electric eliminator is lack of Underwriters' approval in explosive atmospheres. Underwriters' Laboratories will not approve any equipment in such locations which has exposed electric parts (such as the points of the bar). Factory Mutual, however, has approved certain of the shockless static bars for use in hazardous locations where better elimination is needed than can be provided by grounding devices.

Radioactive static eliminators. Radioactive elements, such as radium or polonium, plated on a metal rod or plate, produce alpha rays which ionize the air and so neutralize materials.

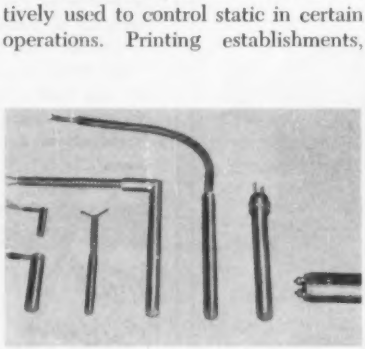
One of the main advantages of this type of eliminator is that no electric connections are required and it can be installed very easily. In addition, since there are no electric parts, it can be considered absolutely safe for use in an explosive atmosphere. However, it is relatively inefficient.

Chemical compounds can be effectively used to control static in certain operations. Printing establishments, plastic-sheet processors and textile manufacturers, for example, use this method. Results are said to be excellent where stencils for screen process printing have been sprayed with a liquid antistatic dressing. Limitations of the method may include the extra step of application and the cost of the chemical.

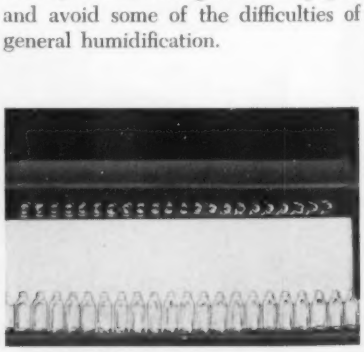
Humidification is a time-honored means of eliminating static and is particularly useful for certain grades of cellophane, paper and other materials which will absorb moisture readily. It is not moisture in the air which eliminates the static, since humidified air remains a good insulator; actually it is moisture absorbed into or deposited on the surface of the material to be discharged which gives the desired result. The material then becomes slightly conductive so that static charges flow through it to any grounded part of the machine with which it comes in contact.

A disadvantage of humidification is that time must be allowed for the material to absorb moisture. Rolls of material will absorb moisture very slowly, particularly the inside layers if they are tightly wound. Pre-conditioning in humidified storerooms may, therefore, be more effective than humidification in the workroom. Another disadvantage is that so many of the modern packaging materials are virtually non-hygroscopic and enough humidity must be present to permit the deposition of a slight film of moisture on the surface of the material.

Specially designed humidification units have become available; they control the amount of moisture produced and direct it right into the material at a specific location. They are particularly effective on hygroscopic materials, such as cellophane and paper, and avoid some of the difficulties of general humidification.



ELECTRIC cartridge heating units. Examples of types used for package machinery and applications—for insertion into beds, blocks or guides to give needed heat for package bonding. (*Vulcan Elec. Co. photo*)



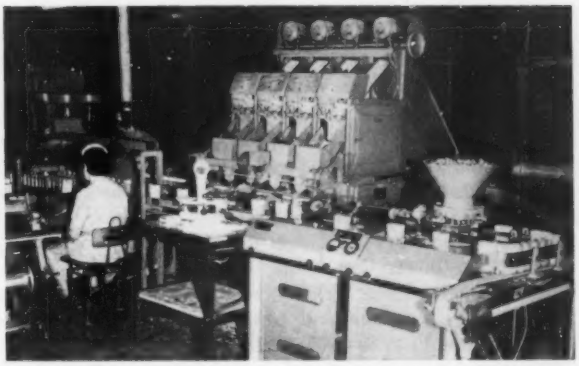
INSPECTION light, mounted on conveyor, instantly detects damaged or dirty containers. Also spots foreign objects in empty containers, or fill level. (*Photo, Terriss Div., Consolidated Siphon Supply Co.*)

Scales used in packaging

by Arthur Sanders*



CHECK WEIGHING butter packages on scale especially designed for corrosive conditions. (*Photos, Scale Mfgrs. Assn.*)



AUTOMATIC CHECK WEIGHER. Filling machine deposits noodles as hopper (*right*) inserts ingredient tablet in boxes.

One of the most important elements of packaging is accurate and speedy weighing. Underweight or overweight, or time losses, can be the cause of serious repercussions.

Small errors in overweight can result in substantial financial losses to the packer. Multiplied thousands or tens of thousands of times, they can quickly mount up to tremendous sums. Even when handling small quantities the losses can be expensive. However, with the very large flow of material found in the modern packaging process the potential savings which result from sustained, accurate weighing are most worth while.

An example of the costliness of overweight is the case of a nationally known flour mill which could lose $500,000 a year if a scale allows ½ oz. overweight on each 25-lb. bag of flour on the packaging line. An annual loss of $100,000 could be sustained if overweight of ¼ oz. per package were permitted for 8-oz. packages of breakfast food.

Inadvertent errors in underweight can seriously affect customer relations. They may result in customer dissatisfaction with the product; too, they involve common morality and good business ethics. In addition, there is the legal necessity for giving purchasers full net weight.

The package revolution has brought with it a growing trend for Federal, state, and local government agencies to step up package inspection programs for quantity compliance. Generally, these agencies are the state and local weights and measures administrations; and, for interstate commerce, the Food and Drug Administration, the U.S. Department of Agriculture and the Federal Trade Commission.

The National Bureau of Standards is indirectly concerned through its promotion of uniformity in weights and measures laws and methods of inspection. The Bureau, each year since 1905, has sponsored the National Conference on Weights and Measures, composed of Federal, state and local weights and measures officials. The Conference develops model laws and regulations which generally set the pattern for the nation's weights and measures enforcement and almost immediately become the standards in every state.

Weights and measures regulations affect packaging, bagging and checkweighing scales in two ways. First, the packages and bags are subject to weights and measures enforcement. Second, in many situations, the weighing devices are subject to the laws and to inspections and they should conform to the Scale Code of the National Conference.

The National Bureau of Standards publishes Handbook 67 which is entitled "Checking Prepackaging Commodities." This is a manual on package-checking procedures for use by weights and measures officials and it also should be useful to firms involved in packaging. Essentially, this manual starts with the premise that, for each lot checked, the average weight shall at least equal the stated net weight, but with no unreasonable variation in any package.

Types of scales

Conveyor scales. Used industrially because they allow materials to be weighed by moving on a conveyor without stopping or slowing up the rate of flow, unloading terminals use them in receiving bulk shipments from ships and railroad cars, in departmental transfers or in measuring production.

Conveyor scale operations have two important variables—(1) belt-speed changes and (2) conveyor-load changes—to take into account.

Two totalizing methods are in common use—electrical and mechanical. Mechanical systems often have higher capacities than electrical.

In electrical conveyor scale systems, three interconnected units—(1) transmitter, (2) totalizer and (3) belt-speed compensator—measure the material carried by the conveyor belt.

Mechanical integrating systems make use of a scale beam to counterbalance conveyor-belt load and scale levers which support conveyor idlers. Duplicate installations prove valuable by providing check weights. Conveyor scales must be engineered, designed

* Executive Secretary, Scale Manufacturers Assn., Inc., Washington, D.C.

and installed for the handling of specific problems.

Net weighers and fillers. Usually, scales weigh the product in a permanently attached receptacle (hopper) and thereafter discharge the net contents into the waiting bag. At that point, scale similarity ceases.

Least complicated is the single-unit net weigher that fills one container at a time from the single hopper with a single filling spout. Almost a manually operated unit, it may require an empty container to be placed at the discharge spout by an operator who then initiates the hopper discharge.

Even in its simplest form, it is semi-automatic through the force of gravity feed, weighing and tripping when counterbalance is achieved. With the addition of tried and proved control mechanisms, the unit can be developed so it will be either semi-automatic or automatic, semi-continuous or continuous.

The multiple-unit weigher uses from two to 10 weigh hoppers and discharge spouts to fill that number of containers simultaneously. Speed can be improved somewhat with this arrangement; accurate filling can be up to 60 cycles a minute, or greater.

One outstanding feature of the line of net weighers and fillers is that the filling problem is approached from the standpoint of accuracy. Check weighing, of course, enters the picture after the net-weighing operation and, if the filling machine is not a net weigher, the check weighing may be a frequent spot check to see that everything is in order. If the filling is done by use of a volumetric filler, it is advisable to utilize a continuous weight checker to assure control of over and under filling.

Capacity of automatic net-weighing and packaging scales ranges from a low of ⅛ oz. to a high of 2,000 lbs., but most of them range between ½ to 1 lb. to 50 or 100 pounds. A more recent scale handles bulk packages of flour in 2,000-lb. containers going from the miller to large bakers and wholesalers. As in all types of filling, speed of packaging with net weighers depends on type of material handled, weight of packages and, of course, on extent to which the net-weigh packer is automatic. Ranges indicated may be from one to 60 a minute.

Gross weighers and fillers. In bag or package weigh filling the operation is either net (the container not weighed) or gross (the container is weighed with the product, but accounted for by set-off). In either event, the law requires that the product in the bag or package be full net weight.

In gross weighing, the bag or container rests on the weighing platform or is suspended from the weighing elements. The weight of the container is usually "tared off" on the scale—that is, with the empty container on the scale, the weight indicator reflects zero. Most scales used for this purpose have tare adjustment mechanisms.

When there is only a very small variation in the weight of the individual containers, the tare set-off can be fixed for continuing operation. If the variation is substantial, the tare adjustment may be observed and made for each weighing or as needed. Also, automatic tare adjustment can be obtained for gross weighers.

Otherwise, almost everything said above for net weighers and fillers holds true for gross weighers. Almost all the following types of scales are usable as gross weighers. Of course, for production operations it is most important that scales especially adapted to the job be used, and often design weighers are advisable for the speed and efficiency needed.

Continuous check weighers. The problem of overweight (profit loss) and underweight (law violation) of fast-moving packaging lines can be controlled with continuous check-weighing scales installed as an integral part of the conveyor line; they do not interrupt production flow. Moving across the weighing element, if the package is correct with reasonable tolerances (e.g., plus or minus ½%), it will pass along for sealing and shipping; if underweight, it is shunted to one side for adjustment and if overweight to the other side. Continuous check weighers of special design provide for such functions as checking material density, thickness or gauge.

Predetermined weight scales (over and under type). Sometimes called equal-arm or unequal-arm scales, this type is particularly important in material flow because it determines almost instantly how much the load differs from desired weight. The scales may be set for operation at any predetermined weight within their capacity. Using only first-class levers, they are limited to small capacities with a top of about 150 pounds.

Predetermined weight scales are light, portable, easily and quickly read and highly accurate and dependable. Designs are available to fit scores of industrial weighing uses, and are extensively used in filling packages and in check weighing filled bags. Various pans and scoops can be mounted on the commodity platter, and the indicating tower, with either end or side indication, can be placed for best reading by the operator.

Counting scales. Counting by weight—ratio counting—has a tremendous vogue. It is more accurate and faster than human counting and cuts costs enormously where applicable. The ratio counting scale principle is to balance a counted number of identical parts against a batch of the same parts at a given ratio.

As a matter of fact, these scales can be obtained with ratios of: 99:1, 9:1, 100:1, 10:1, 50:1, 72:1 and 12:1. The latter two, naturally, are designed for issuing items in predetermined lots of a dozen or some multiple thereof.

Counting scales range from the smallest capacity (next to laboratory balances) to as large as necessary, in such work as: packaging small parts; receiving, storing and inventory control of stock; accounting; distribution; production scheduling, and incentive wage determinations by plants.

Bench or counter scales. Small capacity, portable scales for use on benches or other places where the platform is at working level. Designed for use in between even-arm and floor-type scales, bench scales may be equipped with either beam-type weight indicators or with automatic reading dial indicators, depending on the intended use. Dial indicators may be either full-face or fan dial. Fan scales are sometimes equipped with computing dials, or other special indications. The bench or counter scale can be fitted readily into a roller conveyor line to get the weight of the moving products.

Portable platform scales. Sometimes, the distinction between portable platform scales and bench scales is hard to draw, but, in general, portable platform scales are of the floor type, have wheels for greater mobility and can be used to weigh heavier loads. One of their chief advantages is that they can be taken to the weighing job with little trouble. The floating platform, or load receiving element, is mounted on a rugged cast-iron base to which the wheels are attached. These scales normally have capacities up to 1,000 pounds. For special purposes, capacities may be

even bigger—for example, the portable rolling mill scale of 10,000-lb. capacity for weighing steel and other metal products.

Features available are: bag racks, hoppers, double beams (for net and tare weight record), full capacity beams dispensing with loose weights, over-and-under indicators to speed repetitive weighing, drop levers that protect the scale mechanism from sudden heavy-load drop shocks, metric weight indicators, raised platforms for weighing long bulky articles, short iron pillars and large platforms, odd-sized platforms, cast-iron platforms, five- or seven-bar beams (for successive number of loads weighed without weigh container being emptied each time), and many others. Portable platform scales are available with any type of weight indicating desired.

There are some variations of these types of scales that should be mentioned. The *continuous weigh* feeders are used for feeding various materials through one or more processes. The *automatic batching scale* is a series of electrically interlocked automatic scales (usually time cycled) which batch proportionately—often the key to automated plant operation. *Hanging scales* are adaptable in plants where floor space is at a premium. *Overhead track scales* work in conjunction with a monorail and weigh materials suspended from above while they are moving about the plant. *Crane scales*, classified as commercial or industrial, include all weighing principles—levers, springs and load cells.

The use of mercury or magnetic switches, photoelectric cells, electronic controls, printing and recording devices, push-button or manual remote panel controls, electrical or mechanical interlocking features make tank and hopper scales most flexible. They are also of considerable interest to production and management personnel as labor-saving devices.

Cost of scale errors in pounds and dollars

Scale errors	*Error for 100 weighings*	*Annual error cost 300-day year/100 weighings daily*	
		$1 a lb.	*$.10 a lb.*
Oz. 1/16	0.39 lb.	$ 117	
1/8	0.78	234	
1/4	1.56	468	
3/8	2.34	702	
1	6.25	1,875	
Lbs. 1	100 lbs.		$ 3,000
5	500		15,000
10	1,000		30,000

The above table can be used as a ready means of computing the cost in pounds and dollars of any scale error for any particular number of weighings, or number of days, at any value per pound. Thus one can avoid the complications of 16 ounces to the pound, with their fractions and multiples, which often discourage the practice of computing real costs of small weighing errors.

For example, using first two columns: cost *in pounds* of a 3/8-oz. error for week of 500 weighings is obtained by multiplying 2.34 pounds by five for total of 11.70 pounds. If product averages $.67 a pound, the cost is $7.84. For *annual* error cost of 3/8 oz. at $.67 for 50 weighings a day, multiply $702 error of $1 a pound (Annual cost col.) by $.67, then multiply by 50% (50 weighings a day against 100) and the answer is $235.17. Another example: a 1-lb. error at $.19 a pound for 40 weighings a day for a year is $3,000 times 1.9 (to raise $.10 a pound to $.19) times 40%, for an error of $2,280.

To compute for errors not shown on table, use multiplication or division to increase or reduce the totals of table. For instance, if first example above were a 3/4-oz. error instead of 3/8, multiply by two for an error cost of $15.68 a week.

Scale accuracy

In the field of industrial weighing, obsolescence exacts a heavy toll because people believe that any scale is satisfactory if its capacity is high enough to weigh the object. An old scale may or may not be obsolete, depending on the particular use to which it is put, but it is always best to ascertain if there is a better way to weigh with an improved design.

Even the best scale that is manufactured is worthless—and may be very expensive—if improperly maintained. This is particularly true with some of the newer automatic weighing devices that are part of a production line or overhead conveyor system.

The most serious barrier to accurate weighing is friction. In most weighing operations, the knife edges of pivots carry the load placed upon the scale. When new, these edges are keen; with long usage, however, they become dulled and friction increases. As a result, it takes a heavier weight to record any given amount. There are only two cures for friction: repair or replacement.

The plus or minus tolerances allowed by weights and measures authorities are usually about 1/10 of 1% of the weight load for scales used inside the plant and 2/10 of 1% for "outside" scales, such as railroad and motor truck scales. These apply to scales used for buying and selling transactions. In general, the 1/10 of 1% is a reasonable yardstick for most scales.

In addition to scale accuracy, however, weighing operation cost depends on labor cost. Thus, it is important that: (1) the correct scale type be selected, (2) a sufficient number of scales be used to avoid excessive handling and (3) a study be made of load-moving methods to the scale, reading and recording the information, and then removing the load and dispatching it to its final destination. Unnecessary handling often results if this third step is not recognized. Frequently, automatic loading and unloading devices can be used to advantage.

Maintenance tips

1. Keep scales clean. Blow out base with air hose periodically.
2. Do not oil working parts. Oils and light greases gradually spread or "creep," and contaminate working surfaces.
3. Avoid overloading. Every scale is built for a maximum defined capacity. Consistent overloading impairs accuracy.
4. Never drop loads on the platform. Heavy impacts damage balancing members and bearing surfaces.
5. Do not allow unauthorized personnel to adjust mechanisms. Scales are accurate instruments that require precise adjustments.
6. Prevent scales from being used for purposes other than those for which they are intended. Improper use may damage or contaminate them.
7. Have an authorized serviceman inspect scales at regular intervals.
8. Make sure that serviceman periodically "packs" the pivot and bearing surfaces, and applies rust and corrosive preventatives. This will prevent frictional build-up and insure maximum accuracy.



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Thousands of manufacturers use Markem equipment to mark their packages—not only to make their packages more attractive, but to save money as well. You can, too, with a Markem Method working in your plant. This is a combination of the right *machine, type* and *specialty ink* to *identify* or *decorate your packages* at the *rate you need, as you need them.* Whether you want to imprint variables on bakery labels, set-up or flat folding boxes, plastic bags, lithographed cans or lids . . . print pressure sensitive tape with product name, trademark and directions for use . . . screen print decorative designs on molded plastics—there's Markem equipment and a proven method for the job. You eliminate the high cost, delays and inventory problems of "outside printing"—because even very short runs and frequent variable changes are practical with Markem equipment. And you never have waste from obsolete markings, because you mark *only* what you need.

Markem machines include a wide variety of flat and cylindrical object printers, plus the new Unitized Printing Heads which allow marking to be integrated with packaging operations; typewheels, masterplates or typebars make imprint changes fast and easy; thousands of specialty inks—including the remarkable new instant-drying Thermomark process—offer virtually any combination of color, drying speed and special property you want.

Ask Markem for specific recommendations to meet *your* package identification and decoration marking needs. Nearly 50 years of experience—in all industries—and a single source for the *whole* answer, stand behind every Markem quote. Write Markem Machine Co., Keene 11, New Hampshire.

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everything industry needs . . . for profitable marking . . . since 1911

Taping shipping cases

Taping of shipping cases is coming into wider use because of specialized requirements such as parcel post regulations and the need for cleanliness and re-use of cases.

Taping and gluing of cases should not be considered mutually exclusive. There is a growing trend toward incorporating both methods of sealing in a single line. In high production sealing, glue has an advantage of economy whereas the cost factor has led to resistance against the use of tape. Innovations in equipment are breaking down this resistance.

Tape-applying equipment may be divided into two major types: (1) devices designed to be added to standard gluing and sealing machines to convert these units to use for gluing, taping or both; (2) tapers that are complete single-purpose units.

General improvement has been made over the years in both light-duty and heavy-duty types of dispensers. Lighter materials, without sacrifice of strength, have been adopted. Electrically driven dispensers are being used to some extent for heavy and continuous operations.

Moistening features. The effectiveness of a gummed-tape seal depends on the permanency of the grip or bond between the kraft sealing tape and the container surface; therefore:

1. The glue must be a suitable type and grade for the intended use.
2. The moistening action must condition the glue properly for quick, deep penetration into the dry, porous box surface, where it hardens to form minute hooks anchoring the tape permanently to the kraft liner. If too little water is applied, it does not penetrate and condition the glue. The resulting weak seal breaks open in a few hours. Too much water slows up application, for the tape can slide out of place and requires longer rubbing to set. When excess water dries out, the glue solution may not be strong enough to stick firmly.

Failure of gummed tape on shipping containers results from faulty application more often than from defects in the tape. An advantage of automatic equipment is that practically all elements of chance are eliminated in moistening the gummed tape to the proper degree.

To meet special conditions in cold shipping areas or in refrigerating rooms, electric heating units are employed to keep the water in moistening tanks at proper temperature.

Measuring features. Less critical than the moistening operation, but still an important advantage of many modern machines, is their tape-measuring function. Visible measuring gauges and set stops for standard lengths are two devices used.

Where gluing is a generally satisfactory method of sealing, tape may be needed only for special requirements. In this case, the adapter-type unit is preferable. Also, this unit is advantageous where production requirements may call for the use alternately of tape and glue.

Taping equipment is available to do the complete job of closing flaps, moistening and measuring tape and applying it. This saves floor space.

These machines and tapes with fast-setting glues provide production rates that readily keep pace with today's high-speed packaging lines.

GEISSEL Continuous strip hinges applied with GEISSEL automatic high speed attaching machine

ATTACH TWO HINGES PER BOX AT RATE OF OVER 800/HR



103 Styles for Plastic Boxes, Paper Boxes, Cigar Boxes, Key Cases, Record Cases, Toy Boxes, Jewelry Boxes, Etc.

Large number to fit every type of box. Available in assorted finishes. Continuous strip hinges can be supplied with 90° stop or full acting.

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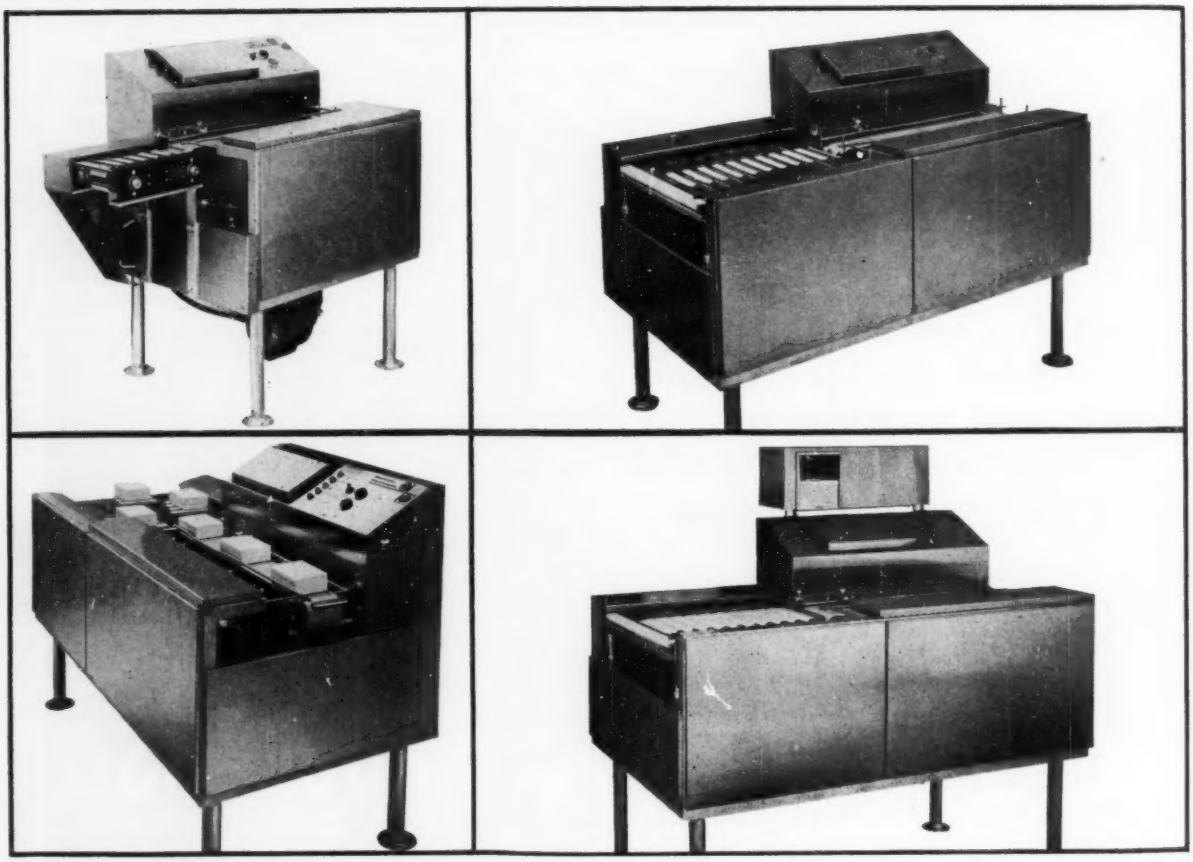
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When the line runs, capacity counts! Illumitronic Checkweighers . . . Weight Monitors and Classifiers are rugged, accurate, and consistent performers in demanding environmental conditions. These machines are operating with cartons, bags, cans, pouches, tubes, trays, overwraps, blow-mold plastics, and products unsupported by packages. Speeds to 300 units per minute. Accuracy ±1/30th of 1 oz. Weights to 10 lbs. Investigate the economies of *automatically weighing in motion with featherweight accuracy!*



Write — or dial 415, RE 9-2395

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680 East Taylor Sunnyvale, California

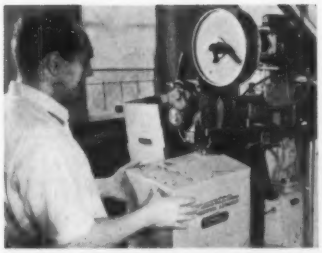
THERE ARE MANY GOOD REASONS TO CHANGE TO STAPLING...MAY WE DISCUSS THEM WITH YOU NOW?



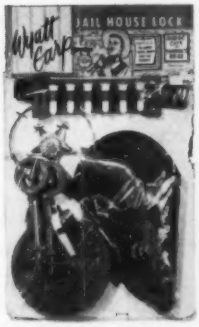
Assembling blister packs. Blister pack advantages for a modest investment



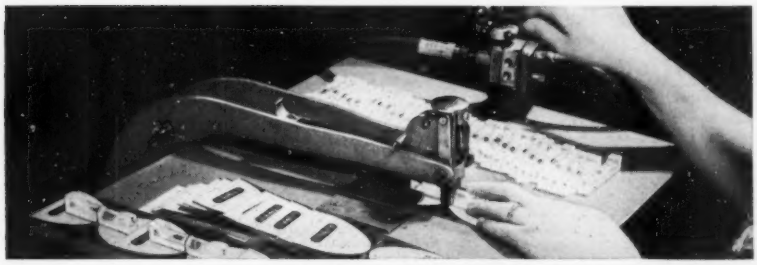
Fastening folded tops of paper bags. Clean, quick, positive seal



Fastening bottom flaps of corrugated shipping containers. Set up cartons as needed. Save storage space



Attaching cardboard headers to poly bags. Small staple doesn't clutter header's eye appeal



Attaching small items to cards. Fast, versatile, safe, secure



Attaching small bags or envelopes to large cards. Keeps parts together, protected from loss

Closing twisted or gathered tops of poly bags. Beats tape and tying





Closing tops of corrugated shipping containers. Stapled top and stapled bottom make cartons almost pilfer-proof

SEE
"Stapling Uses and Equipment"
in this issue of
the *Encyclopedia*.

A change to Bostitch stapling can save you time and money—as it improves your packaging and shipping operations.

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STAPLERS AND STAPLES

SECTION 14

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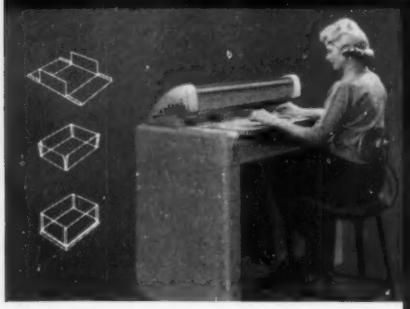
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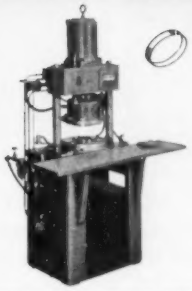
Taber® SHEET PLASTIC FABRICATING MACHINES

FOR FASTER, EASIER, CONSISTENTLY ACCURATE PRODUCTION



30″ THERMOCREASER Model 123

Used to make a tremendous variety of square and rectangular boxes from thermoplastic sheet .005″ to .020″ thick. Thermostatically controlled blade temperature eliminates over- or under-creasing, permits 1200 creases per hour. Can be equipped with dual blades for speed creasing set-up box blanks.



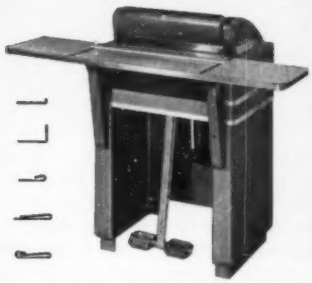
THERMATIC DRAW PRESS Model 146

Electrically operated and pneumatically powered, this press draws and trims round or oval seamless covers. Handles parts up to 8½″ maximum diameter. Produces 600 to 900 high quality covers per hour.



CYLINDER FABRICATOR Model 138 THERMATIC CYLINDER BEADER Model 147

Two efficient units that team together to turn out from 500 to 900 beaded cylinders per hour. The Fabricator forms and heat seals cylinders from 1½″ to 8½″ in diameter, up to 15″ long. Beader forms internal or external beads (or flared ends) on one or both ends of cylinders simultaneously and automatically ejects finished cylinders into a hamper.



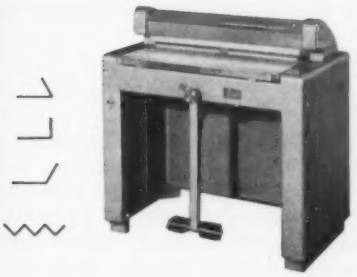
180° THERMOFOLDER Model 103

Forms U-type 180° folds at a rate of 900 or more per hour on plastic sheets up to 18″ wide. Produces tight "snap" folds, folds with an opening, and folds with a lap-over. 90° creasing attachment also available.



BLISTER EDGE FOLDER Model 103-B

Employs a new technique for making U-type 180° folds in edges of blister packages to accommodate slide in cardboard bottoms. Heated 18″ blade actually molds the material into shape. Heat is dissipated before part is released to eliminate tearing or opening up of fold. Produces 600 to 800 folds per hour.



30″ FOLDER CREASER Model 178

Two machines at one price! Handles sheet plastic from .003″ to .020″. Makes a minimum of six hundred 180° folds per hour and "instant creases" 90° angles at minimum rate of 1200 per hour without rejects, tearing or opening up.

STRAIGHT-EDGE THERMOBEADER Model 144-1

Performs automatic continuous beading of straight edges of thermoplastic sheeting at rate of 500-1000 inches per minute. Adjustable for thicknesses from .005″ to .020″. Interchangeable dies provide nine different standard sizes and shapes of beads. Duplex model (Model 144-2) available for simultaneous beading of both edges.



TABER INSTRUMENT CORPORATION, PLASTIC MACHINE DIVISION
111 GOUNDRY STREET, NORTH TONAWANDA, N. Y.

Please mail full information on the plastic fabricating machines checked below.

- ☐ Model 138 Cylinder Fabricator
- ☐ Model 147 Cylinder Beader
- ☐ Model 146 Thermatic Draw Press
- ☐ Model 178 Folder Creaser
- ☐ Model 123 Thermocreaser
- ☐ Model 103 Thermofolder
- ☐ Model 103-B Blister Edge Folder
- ☐ Models 144-1 and 144-2 Straight-Edge Thermobeaders

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

SECTION 14

PACKAGE-MAKING EQUIPMENT

Fabricating packages in-plant

In some circumstances, usually where volume is large or container requirements specialized, a packager may find it practical to install his own in-plant machinery for fabricating containers. Types of equipment available include machines that form or make:

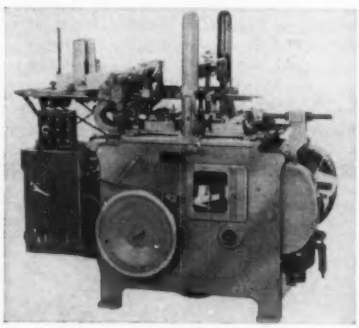
1. Folding boxes
2. Set-up (rigid paperboard) boxes
3. Bags, envelopes, pouches (see also articles on bag-making equipment, this section; pouch formers, fillers, sealers, Section 12.)
4. Corrugated shipping containers
5. Metal cans
6. Fibre cans
7. Metal-edge boxes
8. Paper bottles
9. Rigid transparent containers
10. Partitions.

Accessory equipment that may be required includes machinery for forming liners, cutters, scorers and devices for box doming, window applying, stapling, stitching, tape applying, gluing, spout inserting, printing, etc.

Closely allied to the machinery models that fabricate the package are several important types of equipment that automatically set up a pre-formed container. The advantages include elimination of manual operations, flexibility and closer inventory control.

In some operations, such as packaging of cigarettes, chewing gum and candy (where volume is high and continuous), various units such as carton-making equipment and printing units may be integrated so a packager is, in effect, his own container supplier. However, most in-plant package making is on a smaller scale and is the exception rather than the rule. Where such equipment is employed successfully, certain special conditions in regard to handling, storage, inventory control and flexibility of operations are usually involved.

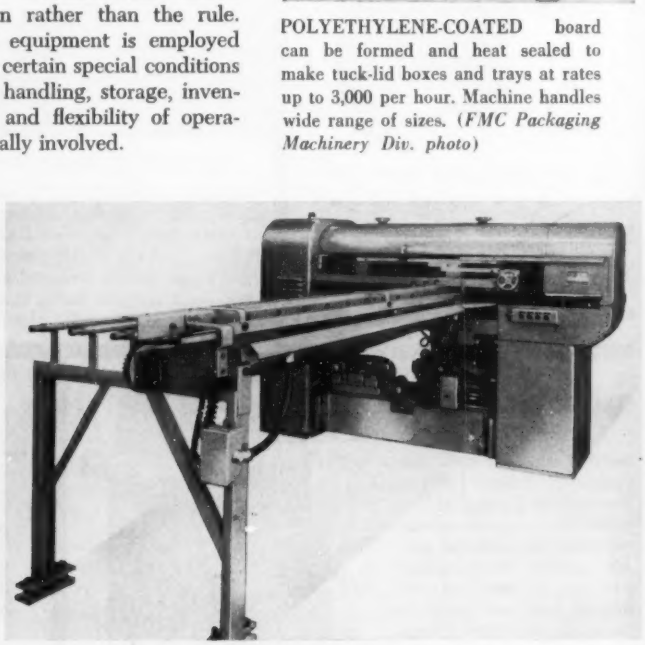
For example, when products are skin packaged, the products are used as the mold for the plastic form and there are natural advantages favoring



POLYETHYLENE-COATED board can be formed and heat sealed to make tuck-lid boxes and trays at rates up to 3,000 per hour. Machine handles wide range of sizes. (*FMC Packaging Machinery Div. photo*)



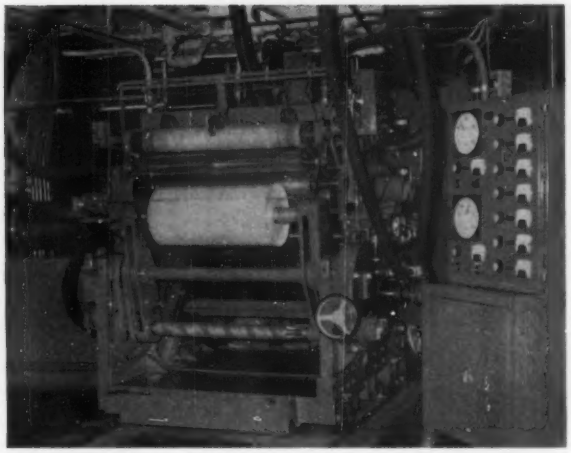
SQUARE-BOTTOM kraft coffee bags lined with Pliofilm are formed, filled and sealed on this unit installed at First National Stores' center. *(Pneumatic Scale photo)*



BOX MAKER produces shipping cartons as needed; size can be changed in 1½ minutes. Unit is adjustable for A, B and C flute, single or double board. Parts easily replaced. (*Colt Packaging photo*)



TRANSPARENT-LID former and sealer. Up to 30 lids per min. produced in sizes 3 by 2 by ½ in. to 14 by 19 by 2½ in. or 13 by 8 by 3 inches. Made from either acetate or polystyrene in sheets from 5 to 10 mils thickness. Size changeovers simple and quick; no forms required. *(FMC Packaging Machinery Div. photo)*



POLYETHYLENE FILM fabricated in-plant by candy company for pouch packaging. Molten film is chill rolled for surface characteristics and gloss that improve clarity. A roll prepares film for printing. It is trimmed and formed into rolls on turret winder. *(Waldron-Hartig Div., Midland-Ross, photo)*

in-plant operations. There are many different types of machines available for blister and skin packaging and the number is increasing. (See articles on: thermoforming equipment, this section; thermoformed sheet packages, Section 8.)

Machines are available also for in-plant fabrication of sheet-plastic containers. In general, this operation is similar to that of set-up box making. Consequently, only large-volume and special packaging considerations can justify this in-plant equipment.

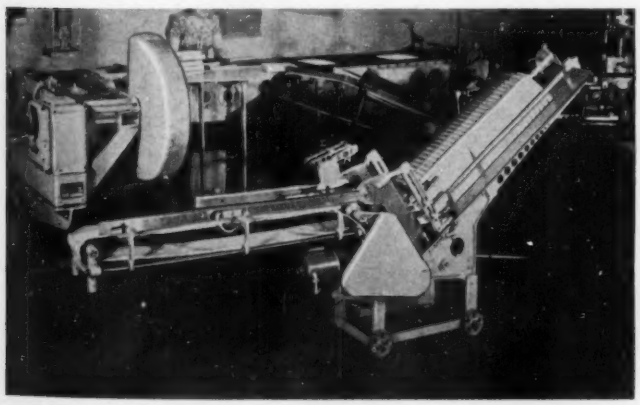
In some instances, injection-molding machines for molding plastic containers have been developed for in-plant use but, here again, only specialized conditions make consideration of these machines practical.

Some in-plant package-fabricating machines are designed to solve the problems that arise when a number of different sizes is required in frequently varying quantities. One compact corrugated-carton fabricating machine is adaptable through such a wide range of shapes and sizes that it constitutes a fairly complete box-making department.

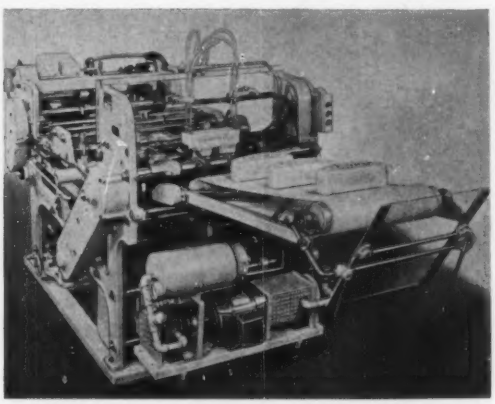
In recent years greater versatility has been engineered into set-up paperbox fabricating machines. As a result, the packager, where specific conditions provide a basis of practicality, can obtain equipment that will fabricate his boxes wholly or in part, including gluing, feeding, wrapping and delivery to conveyors.

Machines that set up folding trays and cartons, particularly the self-locking container types, have gained wide and increasing favor. There are several patented types of trays and carton constructions. One popular type of self-locking carton consists of a completely flat one-piece blank, scored at the fold and die cut to form interlocking slots and tabs. The cartons are set up automatically by machine at speeds ranging up to 150 a minute.

Some eight to 10 different styles of locks are available, the principal types being (1) the stripper lock, (2) the high tip, (3) the concealed corner and (4) the hook-trap lock. Choice of a lock style is influenced by the type of product, weight of board and decorative design. Self-locking corrugated boxes also can be set up automatically and a recent innovation is a machine that automatically sets up self-locking



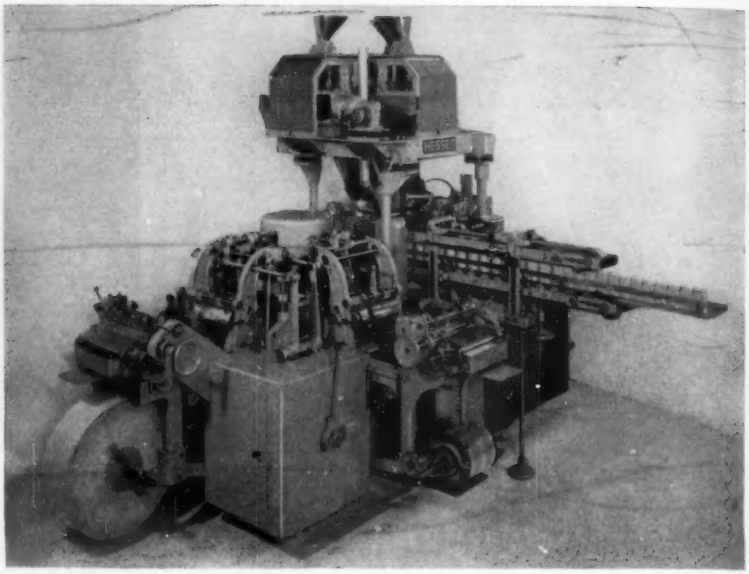
SET-UP BOX STACKER is portable and operates with all types of wrappers and quad stayers. Speed of the stacker is automatically synchronized with that of the other units. *(Stokes & Smith photo)*



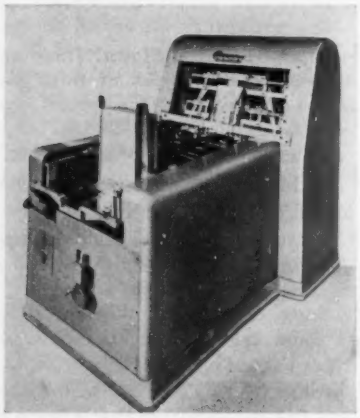
BOX-FORMING MACHINE speeds cigarette-carton production with high rate of 7,500 cartons per hour. *(International Paper Box Machine Co. photo)*



PLASTIC CYLINDERS are beaded on this machine. An operator positions the cylinders and dies form the bead. Ejection of the cylinders is accomplished automatically. *(Taber Instrument photo)*



SINGLE or double-wall cellophane bags are formed from roll stock. After forming, bag enters filling turret where free-flowing product such as macaroni is weighed in. Bags are glued, end labeled. Speeds to 65 per minute. *(Hesser machine, Geveke & Co. photo)*



GLUED CARTONS or trays are formed by this machine from low-cost blanks. Machine is adjustable so it can handle a wide range of sizes. *(Peters Machinery photo)*

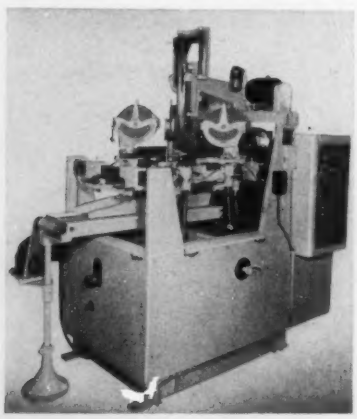
cartons and forms and inserts a corrugated glassine liner.

These self-locking trays and cartons are popular for produce, such as tomatoes, bananas, grapes and limes; for cookies and other baked goods; for dealer and display cartons; for toys and industrial products.

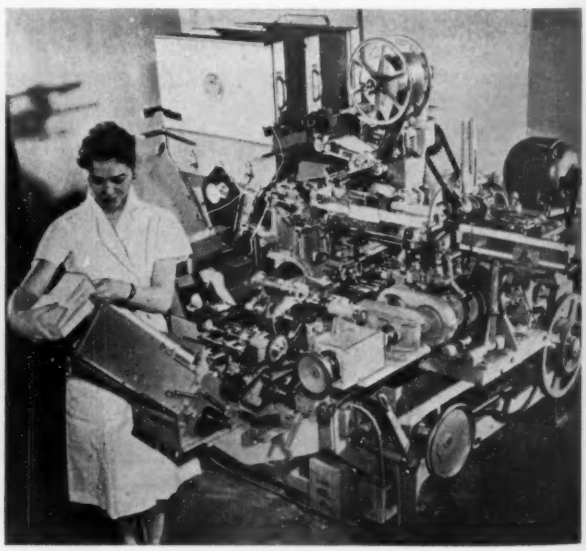
These machines are integrated in the packaging line to supply a constant stream of cartons to the filling machines. An automatic machine closes the cartons.

A newer version of a machine for in-plant use is the carton-forming machine that employs a rope of thermoplastic adhesive, fed from a coil and heated for instantaneous application and adhesive set. This method is advantageous because it eliminates the customary adhesive pot and the problems of heating the resin.

Another recent device for in-plant use applies a heat-release transfer printed on a web of paper to cellophane or other transparent materials. This attachment fits on the wrapping machine. In effect, it provides a practical method of printing transparent packaging materials in-plant.



TRAY FORMER has top suction feed. The machine handles lightweight board, and forms trays with kraft reinforced corners. Speeds up to 100 a minute are possible. *(New Jersey Machine photo)*



HARD-BOX cigarette packer can produce 100 to 120 cigarette packages a minute. *(American Machine & Foundry Co. photo)*

Thermoforming equipment

Two principal types of equipment are used in thermoforming: (1) machines employing atmospheric pressure to shape the sheet and known as vacuum-forming machines and (2) equipment that uses hydraulic, compressed air, mechanical pressure or a combination of these to shape the heat-softened plastic sheet. The latter is known as pressure-forming equipment.

In general the vacuum-forming machines are simpler to operate, are easier to change over, and employ simpler, less expensive dies. These machines are produced by a number of manufacturers and are available in a range of models.

Pressure-forming machines are more complex as a rule. There are not as many companies producing this type of equipment. Some of the most highly developed equipment was built by custom formers, and a large proportion of the pressure-formed plastic packages is produced by custom formers who offer the packager the dual advantage of specialized equipment and know-how. However, some of this equipment is available on a lease basis and some of the manufacturers of vacuum-forming equipment have introduced machines for pressure forming. In general, pressure formers offer greater precision and closer detail. Also, high speed and automation are more likely to result. There are important exceptions, of course.

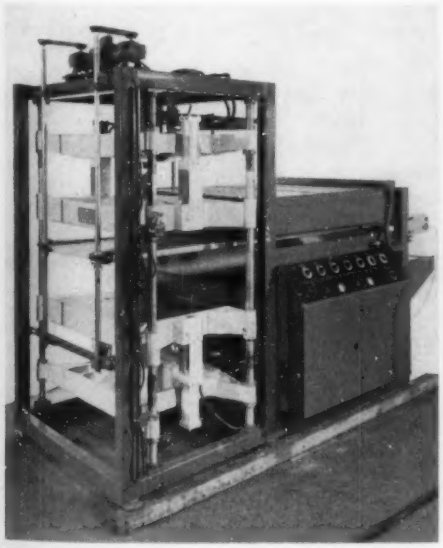
Vacuum-forming equipment ranges in complexity from simple laboratory-type hand-pump models selling for about $100 or less up to regular line models in the range of $1,000 to $4,000 and then up to specialized automatic machines that sell for $10,000 and higher.

Vacuum-forming machines are available in sheet-fed and roll-fed models. As far as practical sizes for packaging are concerned, there is little limitation. Equipment that will handle very large sheet sizes has been designed for making scenery, displays and appliance components.

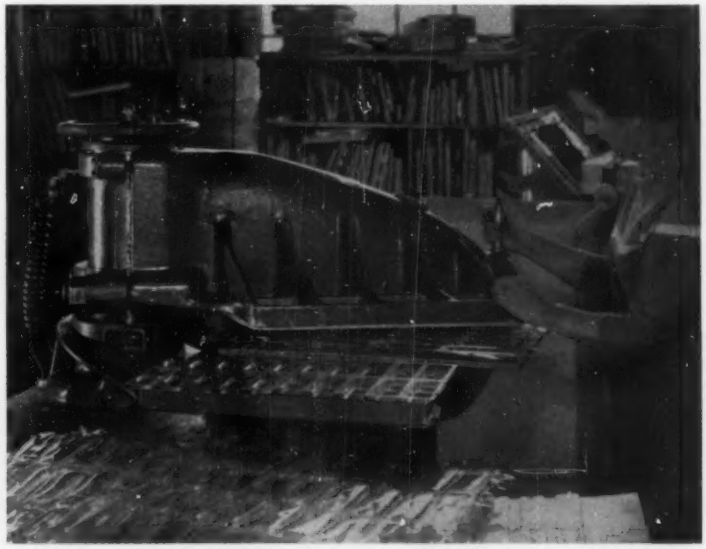
A special type of forming is that known as skin packaging. This simply means the plastic sheet is formed over the product and usually it is heat sealed, during the forming operation, to a paperboard card. Some machines are designed especially for skin packaging and other models are constructed so that they can be used successfully for both skin and blister packaging.

Equally as important as the thermoforming equipment in blister, skin or contour forming is the accessory equipment: jigs, conveyors, clicker presses and heat sealers. Often the over-all efficiency and the success of a thermoforming operation are determined by the skill with which accessory equipment is selected and used. There is a trend toward incorporating more and more supplementary devices into the thermoforming machine itself. This makes for higher speed and usually for greater efficiency, but then the equipment becomes more costly and flexibility may have to be sacrificed.

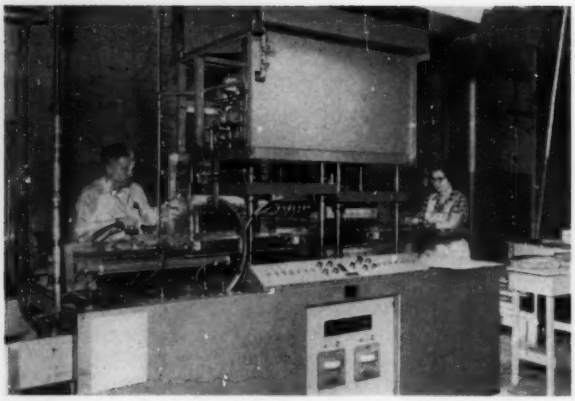
Among the significant developments has been the introduction of machines that do a complete forming and packaging job. Machines of this type are being employed in the packaging of thread, spark plugs and razor blades. These automated, complete packaging machines are finding an important



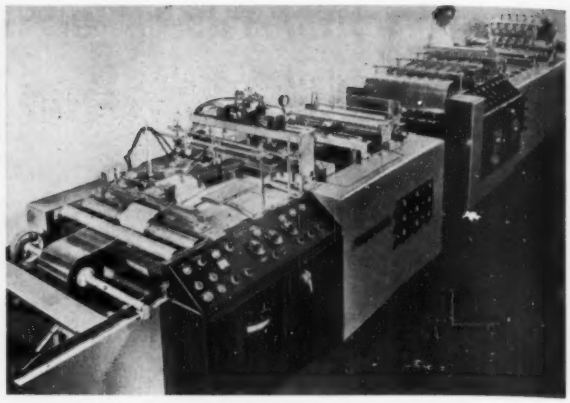
VACUUM-forming machine, operating from roll stock, pre-heats material, forms and trims at molding station—eliminating registration between molding and trimming stations. Mold can open to eject trimmed parts. *(Comet Industries photo)*



PRECISION CUTTING of blister packages is performed with hydraulic-powered, electronically controlled unit. Stroke control switch allows unit to be used as straight hydraulic cutter for conductive materials. Unit shown is at plant of Shaw-Randall Co., cutting 20 acetate blister packs apart. Unit is compact, vibrationless, easy to operate. *(United Shoe Machinery photo)*



FORMING and trimming presses are combined in this blister machine, and synchronized to operate in sequence. Sheet web, fed from left through dancer roll, is held by gripper mechanism until after trimming. Multiple air nozzles for film blowing permit versatility of size. *(Machine, Atlas Vac-Machine Corp.)*



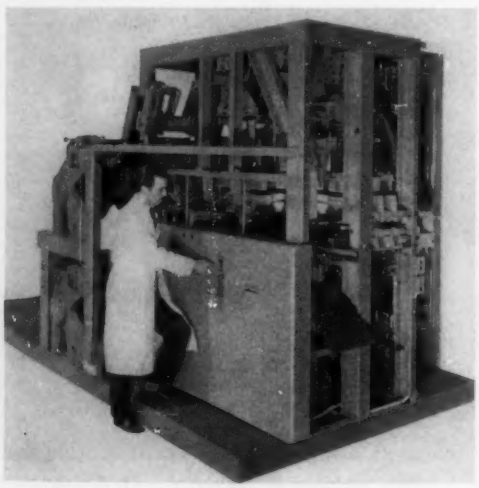
FULLY AUTOMATED blister-packaging unit for such large-volume small items as hardware, electronic parts. Feeds acetate sheet into forming unit, forms blisters to fit item; splits sheets into ribbons of blisters, cuts them apart; inserts item; heat seals blister to board. *(Packaging Industries photo)*

place in the packaging of mass-distributed products, including foods. Speeds up to 500 units a minute are claimed. Moreover, some of the newer films and laminates may spur the use of high-speed automatic equipment for thermoforming.

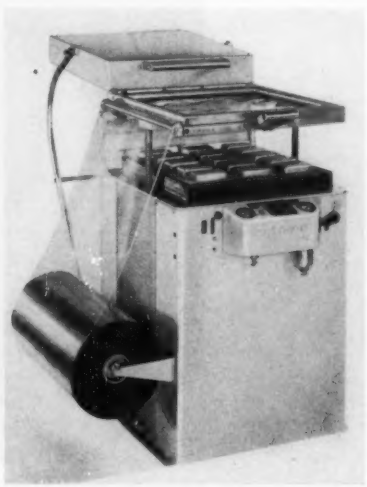
Because there are so many new developments in thermoforming and because the field itself is quite young, the packager should study this field with extreme care when selecting equipment for in-plant use. To have a successful operation, he should know plastics, machinery and packaging and be able to juggle expertly the demands of these three separate elements. Among the factors to be determined before selecting equipment are:

1. Type of package required: skin or blister; card-mounted or all-plastic.
2. Estimated production and potential production. Also what flexibility will be involved?
3. Type of sheet stock to be used. Sheet fed or roll fed?
4. If plastic is to be attached to a card, type of fastening: stapling, heat seal, cohesive card, label or glue seal. (See also p. 301 and p. 307.)
5. Type of jigs and conveyors needed and what steps in package feed and assembly can best be done (a) by hand, (b) automatically.
6. Problems of cutting, stacking and packing the package.

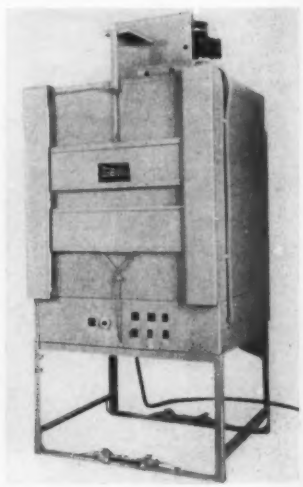
There are numerous approaches that will help the prospective purchaser of thermoforming equipment. He can seek advice from packagers and from custom formers. The materials suppliers should be consulted. A number of them have technical service departments that specialize in thermoforming. He should consult adhesives suppliers and manufacturers of board stocks used in thermoforming. Manufacturers of heat sealers, clicker presses and similar equipment are in a good position to contribute suggestions. Finally, the prospective purchaser will find the manufacturers of thermoforming machines have had many problems to solve in this field and many lessons they have learned will be readily available and of great value in selecting proper equipment.



FAST production with automatic thermoformer. Designed to form extremely thin even-walled containers, to bead edges in one operation. Finished items ejected down chute. *(Conapac Corp. photo)*



SIMPLICITY of operation for short- or long-run thermoforming. Sheet or roll fed. Handles any thermoforming material. *(Plast-O-Craft Co. photo)*



PRE-HEATING oven for plastic sheets has air-operated doors; forced convection type, automatic thermostatic control. *(Gruenberg photo)*

Equipment for coating, laminating, slitting and sheeting

by Dale G. Higgins*

Improvements in modern packaging design and construction place increasing dependence on the appearance and quality of packaging materials. New dependence is placed on absolute uniformity of package material smoothness, brightness, flexibility, rigidity, etc. To obtain competitive advantages in appearance, in quality or in cost, the supplier of packaging materials sparks a never-ending demand for better and more uniform product controls. Attention is centered on technological improvements in the manufacture of coated and laminated packaging materials, as well as on processes used for higher speed web handling.

A basic understanding of the various methods for coating, laminating or cutting packaging materials is essential to employ the new plastics, papers and foils to their maximum advantage.

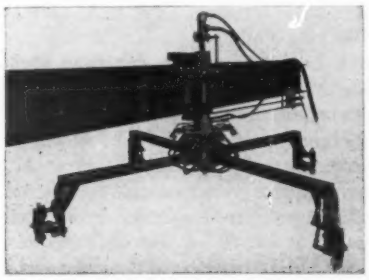
The initial development of coating and laminating equipment was carried forward on an empirical basis to meet market demands. Special wax coaters were developed to produce waxed papers. Designs were made to produce hot asphalt laminating machines to manufacture the demanded asphalt-laminated packaging products. Still other equipment was developed to apply the necessary heat-sealing or moistureproof coating on cellophane.

* Director of Sales, Waldron-Hartig Div., Midland-Ross Corp., New Brunswick, N.J.

Today's research, however, is directed toward creating market demands for the new packaging materials scientifically developed and tailored from predetermined molecular plastic structures with controlled physical orientation. These packaging products are predestined for success by careful application of refinements in converting technology. Newer, smoother, more impervious surface coatings; lighter, stronger, more decorative laminations; crisper, more transparent and sparkling cast films—all these and many more improvements are the result of refinements in the control of coating and laminating techniques.

Coating processes

The purpose of a coating machine is to apply a uniformly controlled amount of a film-forming material to a web or sheet product. Whether the coating is a lacquer on foil for coloring, a wax on paper for moistureproofing, or an adhesive on film for lamination, the basic process can be the same.



SPRAY COATING equipment provides a uniform distribution of coating with an overlapping pattern of spray.

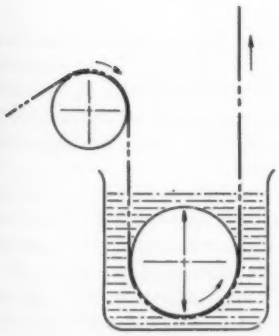
There are five classifications—*spread process, spray process, dip process, roll process and air-blade process*—which, at first glance, may seem crude, but they serve to emphasize the basic distinctions.

Under the classification of *spread coaters* are the various knife or bar coating arrangements. The floating knife depends on web tension as well as on knife-edge contour to regulate the amount of coating. The knife-over-roll may be used in a fixed spacing from the roll to regulate the coating thickness. A knife-on-blanket arrangement is a modified floating knife which uses an endless rubber blanket to press the web against the knife and it is, therefore, not dependent on web tension for control. There are many modifications of knife contours to handle various coating weights and coating viscosities. A typical knife-coating machine may carry any of these modifications or all of them.

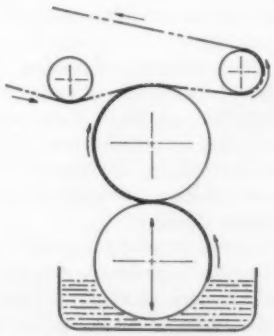
Spray-coating equipment is usually arranged for web operation by the automatic traverse of one or more spray nozzles in a transverse or a circular motion above the moving web. In this way a uniform distribution of coating may be realized by an overlapping pattern of spray.

Dip coating is used when both sides of the web are to be coated in a single operation. Usually the web passes through a metering gap following the dip in order to assure uniformity in the amount of coating at various web speeds.

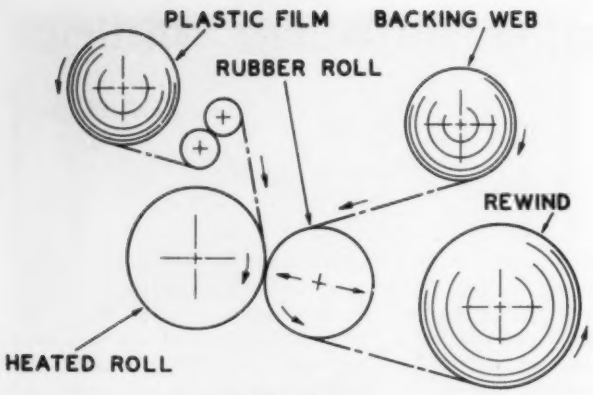
Roll coating is the process of application by contact with a roll surface. The amount of coating may be predetermined by control of coating compound thickness on the roll in advance of the application, or, alternately the web may pass through the roll open-



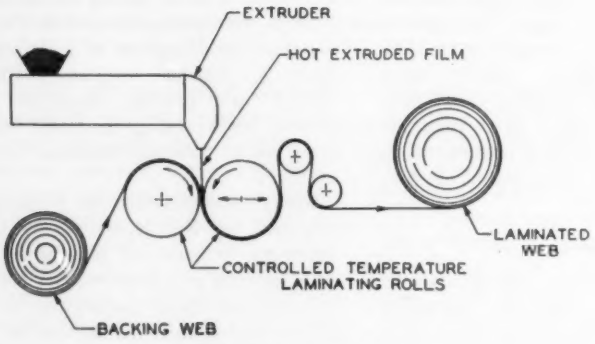
Dip coating



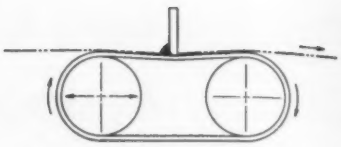
Kiss roll coating



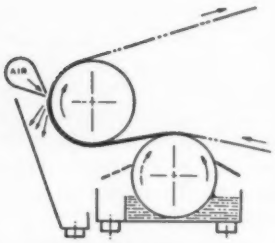
Stretch lamination



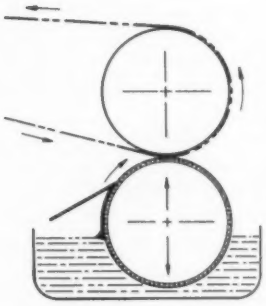
Extrusion coating



Knife-on-blanket coating



Air knife coating



Engraved roll coating



Coating knife contours

ing with the coating. Variations in the roll control of coating thickness may employ a reverse-roll principle or may use an engraved roll to meter accurately the coating in advance of the application point.

A recent development is the use of roll coating in a new process for production of smooth finishes on paper and board stocks for packaging. The excess coating is removed from the paper stock by a reverse roll wiping action. This coating process produces a smooth, level-coated surface as with a trailing blade knife coater but without the coating scratches produced by knife coating.

Air-blade metering of coating is accomplished by the use of a controlled non-turbulent air blast under which the web plus coating is passed. Variation in air volume, air pressure and angle of incidence are used to control the coating thickness.

The choice or selection of the most suitable coating process is determined by such factors as coating viscosity, coating thickness and coating uniformity required in the finished product. Knife coaters are generally used for applications where multiple coats are required or where the presence of coating scratches are not objectionable. Typical applications are found in lacquer or resin coatings on cloth, or adhesive coatings on smooth webs of paper or foil. When the coating-compound viscosity is high, the knife-over-roll arrangement is preferred.

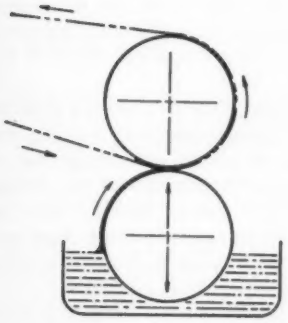
Spray-coating process is indicated for low-viscosity coating compounds and for light weights of coating. Spray coatings do not usually fill and smooth uneven web surfaces as well as the knife-spreading arrangements. Principal disadvantages of the spray-coating process are the need for low-viscosity coatings which require high percentages of solvent or liquid and the loss of coating compound by overspray and by ventilation removal. Many special surface-finishing effects are possible by the use of spray application.

Dip-coating process is usually employed for two-side coating of cellophane with moistureproof or heat-seal surface finishes. The application of melted waxes to various paper stocks is another example of the dip-coating process. Impregnation or saturation coating requirements are usually best accomplished by using dip-coating equipment.

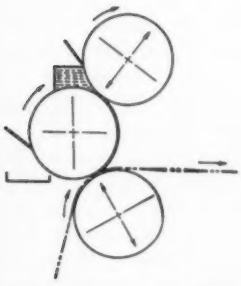
Roll-coating methods are probably the most widely used of the coating processes. Applications of pressure-sensitive adhesives to tapes or re-moistening adhesives for gummed tapes are typical roll-coating applications. Decorative coatings on paper



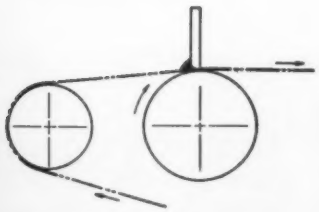
Floating knife coating



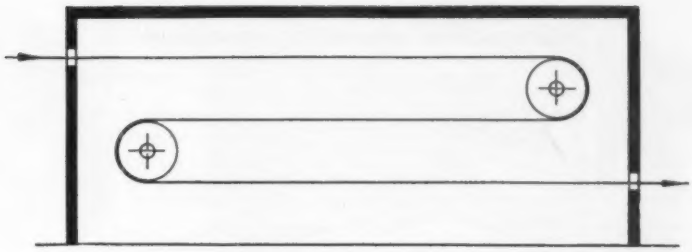
Squeeze roll coating



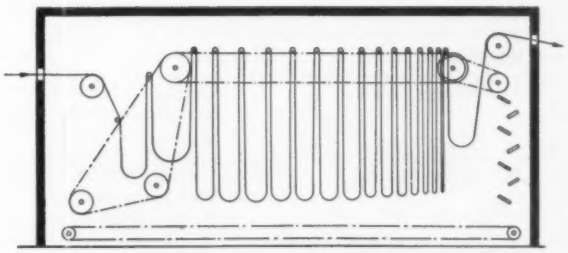
Reverse roll coating



Knife-over-roll coating



Horizontal multiple pass drying oven



Loose stick festooning oven

stocks are usually made on roll-coating machinery.

Air-blade coating applications are usually found in the use of water system compounds where solvent losses and surface skinning of the coating are not a problem. Smooth, uniform, functional surfaces may be obtained on paper and on board stocks by the air-blade coating processes. Application of latices for greaseproofing of paper also is accomplished efficiently by air-blade technique.

Modifications of all coating processes by use of spinning-smoothing rolls, oscillating brushes, vibrating doctor blades, etc., are in common practice. Each coating application problem must be carefully considered to select the most suitable equipment.

Drying process

Probably the least understood part or section of a coating process is the drying oven. Unsatisfactory performance of the coating section is immediately apparent in the finished product. Inefficient oven performance, however, may not be recognized even after years of operation. The basic check points to determine oven efficiency are *uniformity of drying, speed of drying, the quality of the product,* and *the cost of the operation.*

Uniformity of drying is a simple problem of mechanical design. To deliver the drying air at a uniform rate and temperature across the web width, suitably shaped distribution ducts are used, calculated to receive the required volume of air preheated to a uniform temperature. The air circulation system must control the air travel to the point of contact with the web.

Speed of drying is determined by the drying air velocity and its temperature. The problem of air duct design to assure maximum velocity at the point of impingement on the web is an important one. The delivery nozzles or duct apertures must be close to the web surface. Adequate provision must be made for escape and return of the drying air to prevent back pressure and to assure even air flow. Excessive air turbulence causes web flutter and uneven tracking of the web through the oven.

The quality of the finished product may be seriously affected by improper control of the drying air. For coatings which may be "skinned over" or blistered by too rapid surface drying, the oven must be zoned with lower temperatures in the first sections. For products such as cellophane, the end point of drying must be carefully controlled to prevent embrittlement due to low moisture content and degradation. For coatings such as polyester resins which "set" by exothermic reaction, the oven must be zoned to prevent final overheating.

The cost of operation of the oven is the best measure of its efficiency. Adequate insulation is the first consideration. Provision for recirculation of the heated air with a controlled exhaust volume is the second design requirement. Installation of a flammable vapor indicator will permit recirculation of air to an allowable solvent concentration when evaporating flammable solvents. Selection of

Comparison of coating processes

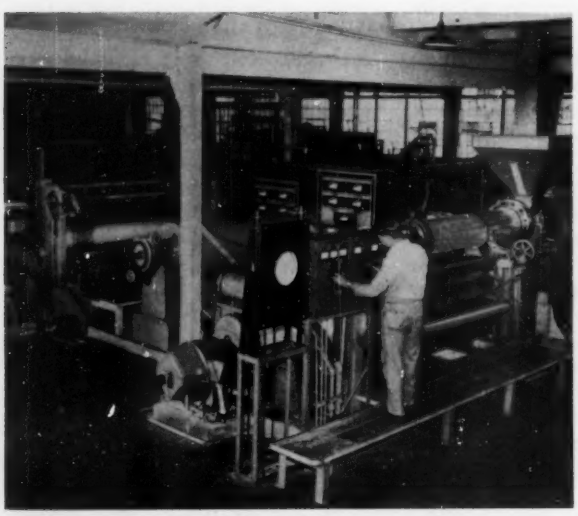
Process	*Advantages*	*Disadvantages*
Floating knife	Good bridging and smoothing	Coating scratches; uneven coating on baggy webs; high web tension required.
Knife-over-roll	Ability to handle high viscosity coating	Coating scratches
Knife-on-blanket	Good bridging and smoothing	Coating scratches
Spray	Good coverage on uneven surface	Loss of overspray; low viscosity coating required; poor bridging
Dip	One or two sides may be coated—good coating penetration of web	Low viscosity coating required.
Kiss roll	No coating scratches	Coating "crow-foot" tendency unless compound has good flow or is smoothed.
Squeeze roll	No coating scratches	Coating unevenness at web thickness variations. Also "crow-foot" tendency on surface.
Reverse roll	No coating scratches; excellent weight control; wide variation of coating range. Level coated surface.	Higher equipment cost.
Air blade	No coating scratches; equal coating on high and low web areas.	Limited to low viscosity coating. Aqueous coating systems preferred.
Extrusion-lamination	No solvent problem; excellent coating continuity or impermeability. Low coating thickness possible.	Coating resins limited to those suitable for flat die extrusion.
Stretch-lamination	No solvent problem; excellent "bridging" or coating continuity; low coating thickness possible.	Coatings limited to special thermoplastic films.

the most economical prime heat source will be determined by local costs of oil, gas and electricity. A directly heated oven is more efficient than an indirect-heating arrangement. A directly heated, gas-fired oven sends the gases of combustion directly into the drying chamber. An indirectly heated, gas-fired oven receives the heat from the gases of combustion through a heat exchanger; this serves to circulate warm air through the oven.

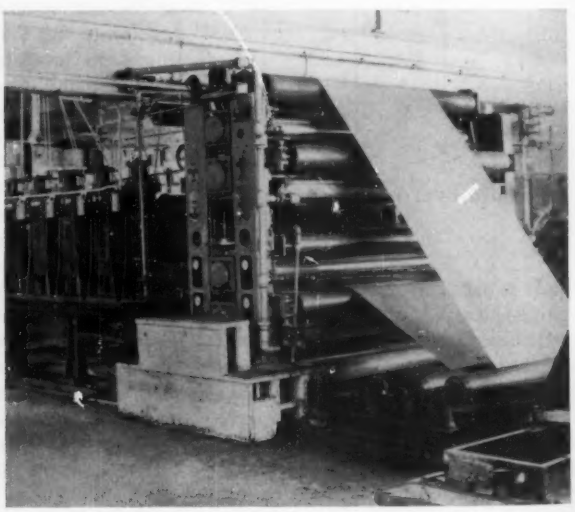
The use of radiant-heating elements often permits adequate heating and drying in a short oven length due to the high temperature of the radiant source. The use of moving air is also required in order to make most efficient use of radiant elements for drying service.

The simplest oven design is a single straight web pass. The design of return or multiple pass ovens permits greater drying capacity in limited floor space. The use of festoon type ovens is indicated for products requiring a long drying or curing time. Tower dryers employing vertical space are used for products that are dip coated or impregnated.

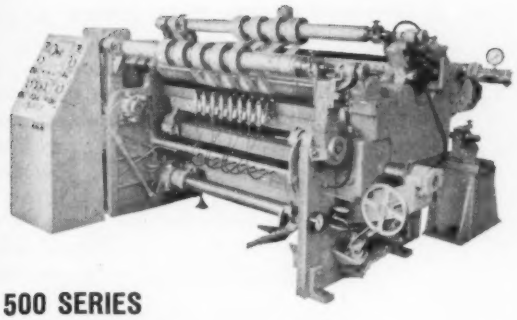
Drum drying is used on products where sufficient evaporation can be obtained on the first drum to permit the coated surface to contact the second drying drum. Evaporation of water from impregnated materials is probably the most common use for this method. The principal advantage of drum drying from a quality stand-



EXTRUSION-LAMINATION equipment shown in actual operation. An operator is at the automatic controls. Thermoplastic material is being melt extruded through a flat-die orifice and pressed against moving web. (*Waldron-Hartig photo*)

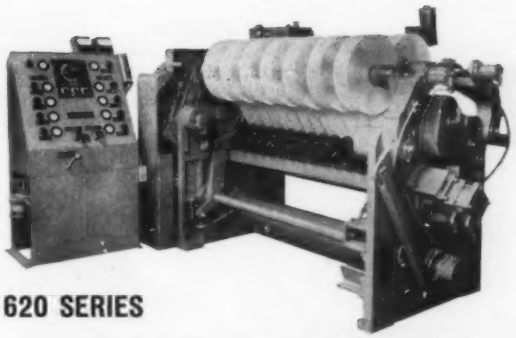


MODERNIZED 105-in. board laminator has dual applicator section, pull roll section, drive from wet end to cutter. Designed for better control of adhesive application and use of newest adhesive formulations. (*Black-Clawson Co. photo*)



500 SERIES

A standard, multipurpose duplex slitter-rewinder for papers, films, foils, fabrics and other web materials. Speeds to 2000 fpm. Trim widths to 62″. Rewind diameter to 20″ maximum. Combination surface-center rewind using the differential driving principle. Rolls alternately wound on separate shafts. Score, shear, or razor cut, single or in combination. Also, Sealcut® electrically heated slitters.



620 SERIES

A heavy-duty duplex slitter-rewinder for papers, films, foils, laminates and other off-caliper materials. Speeds to 1000 fpm. Trim widths 32″ to 72″. Rewind diameter to 20″ maximum. Combination surface-center rewind using the differential driving principle. Rolls alternately wound on separate shafts. Score, shear or razor cut. Can also use Sealcut® electrically heated slitter elements.

Cut web-fed production costs with the superb running qualities of The New Roll

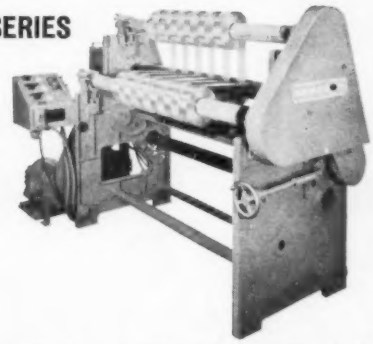


Almost any finished roll of paper, film or foil, plain or printed, can look good on the outside. But, when a roll has been made with extreme care to assure fine, dependable *running* quality we call it The New Roll. The test is not how nice a roll may look, but how well it *performs*. Does it give you a long, low-cost, trouble-free run in high speed printing and converting? Does it keep your material fresh and *alive*, for better end results, or is it stretched out *dead* in the roll?

Superb *running* quality can be produced efficiently and economically *only on a truly integrated roll production system* designed to maintain optimum roll control all the way from unwind to rewind, with all controls adjustable and adaptable to the characteristics of the material to be handled, the quality of the parent rolls, and the intended service of the finished rolls. The truly integrated roll production system, we think, is a job for specialists only.

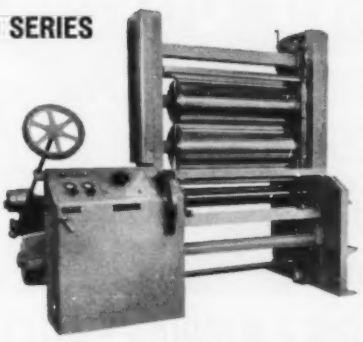
CAMERON
a team of specialists

550 SERIES



A light versatile, low-cost slitter-rewinder for films, foils, papers and other materials. Speeds to 500 fpm. Trim widths 32″, 42″, 52″ or 62″. Rewind diameters to 15″ maximum. Center winding using the differential driving principle. Rolls alternately wound on separate shafts. Choice of razor, score or shear-cut slitting. Integrated unwind with air operated brake and manual side shift control. Optional built-in pneumatic edge guide.

400 SERIES



AA-394

A versatile, highly productive two-drum slitter-rewinder shown here in use as a foil separator for handling lightweight 2-ply foil, with each ply winding on a separate shaft, each rewound roll 15″ maximum diameter. The 400 Series is adaptable to a wide variety of other materials. Speeds to 1000 fpm. Trim widths 32″, 42″, 52″ and 62″. Rewind diameter (single roll) 30″ maximum. Two-drum surface winding. Choice of pneumatic score-cut or shear-cut.

For a quick review of the most comprehensive line of roll production equipment in the industry, write for new Cameron Bulletin **6010**



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famous TIDLAND pneumatic shafts are sold exclusively through Cameron

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K 60 A shown with a heated head **4-7 TON**

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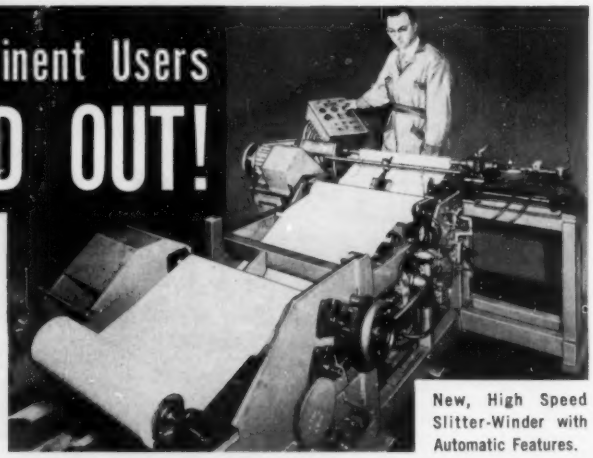
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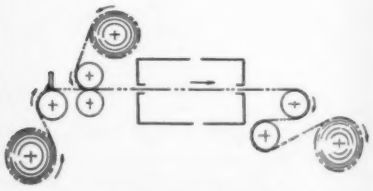
point is the flatness of the dried sheet. From an efficiency consideration, the drum dryer is most effective on thin webs and in combination with surface air movement. Drum surfaces may be covered with Teflon or other finishes to minimize tendency for adhesion of partly dried coating. Drums may be heated by steam, by circulating hot liquid such as oil, by internal radiant heaters or electrical contact heaters.

Laminating equipment

Lamination of two or more webs is required for added bulk or strength, for decorative applications or for impermeability. A typical example of a product laminated for added bulk is laminated paperboard. A product laminated for added strength is paper tape carrying glass or similar strong fibre reinforcement for tear resistance. Lamination of aluminum foil to a paper base for label stock is an outstanding example of the decorative laminate. Impermeable, multiple constructions carrying cellophane, polyethylene, aluminum foil and paper are used for protective wrapping or decorative packaging applications. The use of polyethylene film applied to paper by the extrusion-lamination process is a specific example of a lamination for impermeability or other functional characteristics.

The actual lamination process may be classified as *wet lamination* and *thermoplastic lamination*.

Wet lamination process may be used for permeable webs such as paper or textiles. The two or more webs are pressed together while the adhesive is still wet. The water or solvent in the laminating adhesive may be absorbed by the porous web or it may be evaporated through the web during

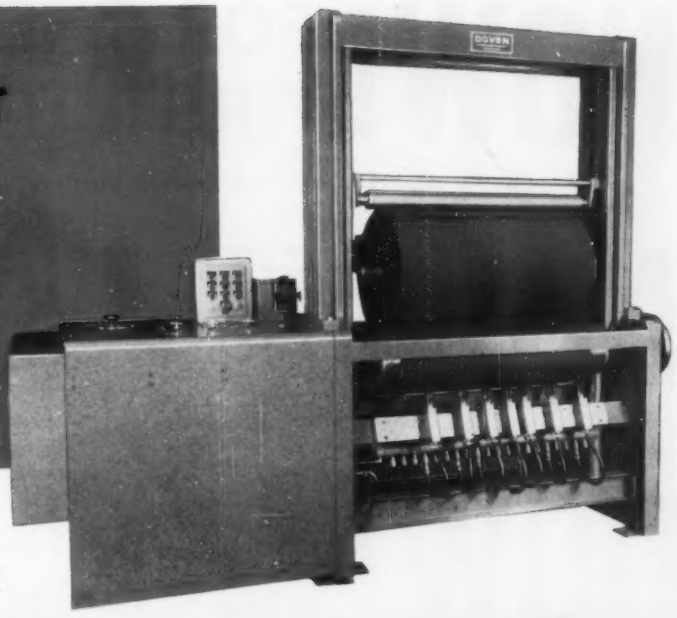


Wet lamination

passage through an oven or over drying rolls. Most paper-to-paper products are laminated by the wet process. A porous web may also be laminated to a nonporous web by the wet process.

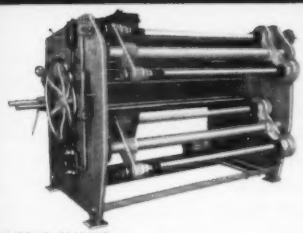
Extrusion-lamination is a hot-melt

7 NEW COMPACT PACKAGES of SLITTING REWINDING SHEETING versatility



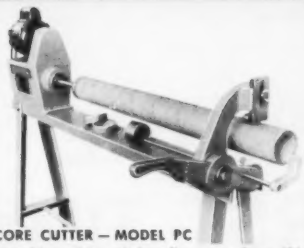
2-DRUM SLITTER — REWINDER, MODEL SR-60

Shears, score cuts paper and board. Slits 1½" minimum width—handles rolls up to 72" wide, 50" diam.



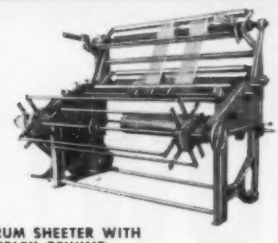
TURRET SLITTER — REWINDER, MODEL CDT-48

Shears, or score cuts paper, board, fabrics, films, plastics, etc. Extremely flexible, extra smooth operation.



CORE CUTTER — MODEL PC

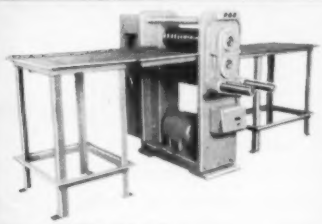
Portable — this unit handles cores from 1½" to 8" inside diameter, core lengths of 36" to 80". Other models for cores from 3" to 12" I.D available.



DRUM SHEETER WITH DUPLEX REWIND

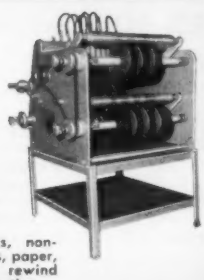
Shears, score cuts paper, fabric, vinyls, films, polyethelene. Sheets from 35" to 120", web widths up to 60".

Specialized equipment built up from standard units like these to satisfy unusual requirements!



HEAVY FIBRE, BOARD SLITTER, MODEL SSH-24HD

Shear cut. Adaptable for sheet stock or rolls. Widths up to 60".



BENCH TYPE RAZOR, SHEAR, SCORE SLITTER, MODEL BDS-24

Used for fabrics, nonwoven fibre glass, paper, films. Duplex rewind principle of operation.



CROSSCUT SLITTER, MODEL CC-36

Used for skin or blister packaging — produces individual square or rectangular pieces from full size sheets.

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Slit 20" dia., master rolls without re-winding

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Pre-set any program of varied size cuts

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We will demonstrate this exciting slitting machine on any of the materials indicated below

NOW! FOR THE FIRST TIME!

A completely new design, fully automatic, from the pioneers and originators of double-knife slitting

Some of the materials that can be slit on the LEVER 2000 and LEVER 500 automatic slitting machines

- Cellophane
- Cloth Pressure Sensitive Materials
- Cloth Typewriter Ribbon
- Cork
- Embossed Polyethylene Film and Sheeting
- Foamed Materials
- Glassene
- Insulation Materials
- Kraft Papers
- Most Flexible Laminates (including foil laminates)
- Metalized Mylar
- Metalized Pressure Sensitive Materials
- Mylar
- Papers
- Paper Pressure Sensitive Materials
- Paper Typewriter Ribbon
- Plastic & Rubber Tubing (for gaskets) and washers, etc.)
- Plastic Pressure Sensitive Materials
- Plastic Typewriter Ribbon
- Polyethylene Film and Sheeting
- Polypropylene Film and Sheeting
- Polyvinyl Chloride—Film & Sheeting
- Polyvinyl Alcohol—Water Soluble Film
- Rubber (cured and uncured)
- Teflon
- Textiles (coated)
- Textiles (uncoated)
- Waxed Paper

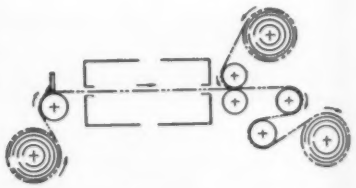
For rolls up to 14" in diameter use the LEVER 500 which combines all the features of the LEVER 2000

LEVER MANUFACTURING CO., INC.
120 West 31st Street, New York 1, New York
Phone: CHickering 4-0140

coating operation. Thermoplastic material is melt extruded through a flat-die orifice and then pressed against a moving web. Control of coating thickness is obtained by the slot opening and by the rate of travel of the web to which it is applied. This process has been extended so it will permit two webs to be laminated by extruding into the entering nip between the two webs.

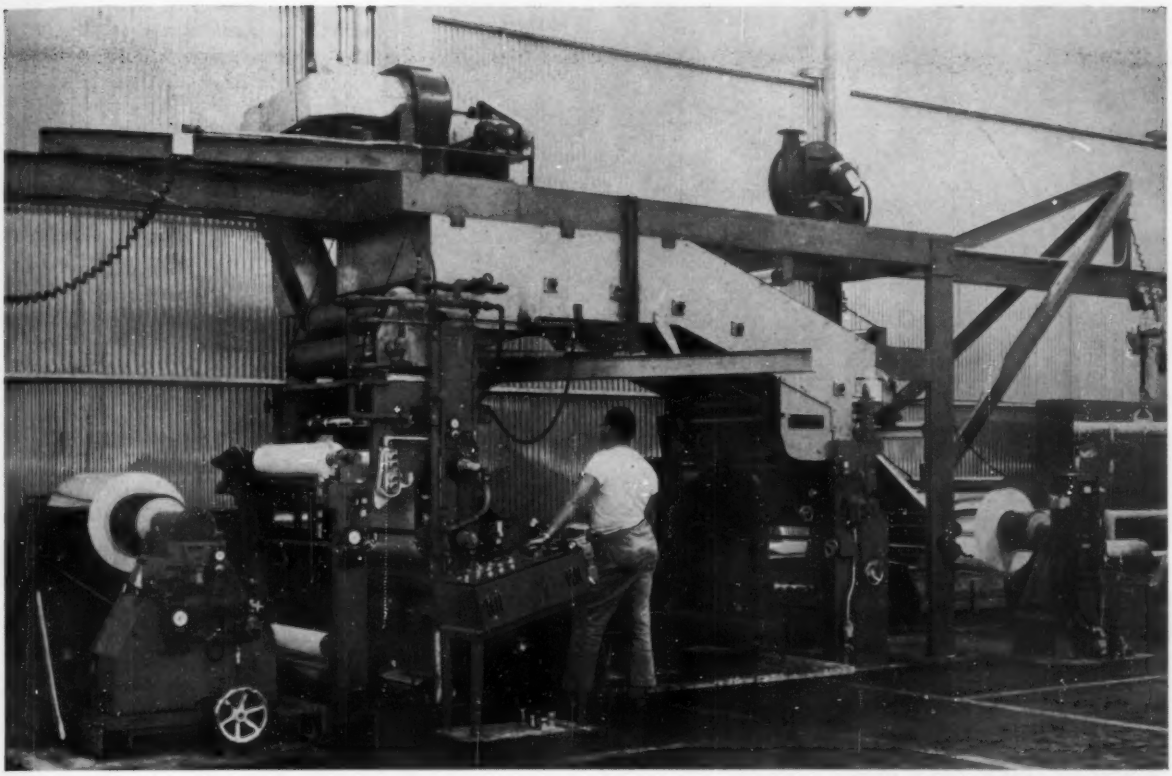
A development of recent years has been the accomplishment of fusion-extrusion or curtain coating of plastisol compounds by flat-die delivery from an extruder. This process uses less power than conventional thermoplastic extrusion and eliminates many of the problems of die design and of stability of formulation. In contrast to conventional methods of plastisol coating by roll or knife, it does not require subsequent passage through a fusing oven. In addition, plastisol fusion-extrusion coating permits either tandem embossing or laminating operation.

Thermoplastic lamination depends on the adhesive character of the web surface at elevated temperature. Some webs such as plastic films are self-adhesive and require no cement or bonding coat. Most thermoplastic laminations, however, employ an adhesive surface coat which is applied from solution or dispersion, or hot melt. Thermoplastic lamination is the most satisfactory method of combining or adhering nonporous or impermeable webs such as plastic films and metal foils. Elevated temperature required for thermoplastic lamination may be accomplished by passage through a hot air oven, by passage around heated rolls, by exposure to radiant heat or by exposure to dielectric heat equipment.



Thermoplastic lamination

Stretch-lamination. Certain preformed thermoplastic films including Pliofilm and polyester may be stretched and laminated to one or two



Inta-Roto WB-500 wax bleed laminator mounting foil on paper in ALCOA plant at Davenport, Iowa.

ALCOA "Extremely Pleased" with INTA-ROTO WB-500 Laminator

Concerning the new Inta-Roto wax bleed laminator now in use by ALCOA at Davenport, Iowa, Glen L. Phillips, Superintendent of the Foil Mill Division, reports:

"In the six months we have had our Inta-Roto WB-500 laminator in operation, we have been extremely well pleased with its performance. The quality and productivity obtained have been most satisfactory. Our Operators and Supervisors all like the equipment because it is relatively simple to set up, adjust, operate, and clean up."

The Inta-Roto WB-500 is designed to produce a variety of "strike through" materials, double and triple laminations, for packaging that assures freshness and long life for cookies, mixes, and perishables of all kinds. Foil can be print-treated for adherence of gravure inks, or coated with vinyl lacquers. WB-500 operates at speeds up to 1,000 feet per minute. Standard web widths are 42" and 48".

Like *all* Inta-Roto machines for the converter, your WB-500 is completely assembled and test-run in our plant before shipment . . . assuring easier, quicker setting up, and earlier production in *your* plant!

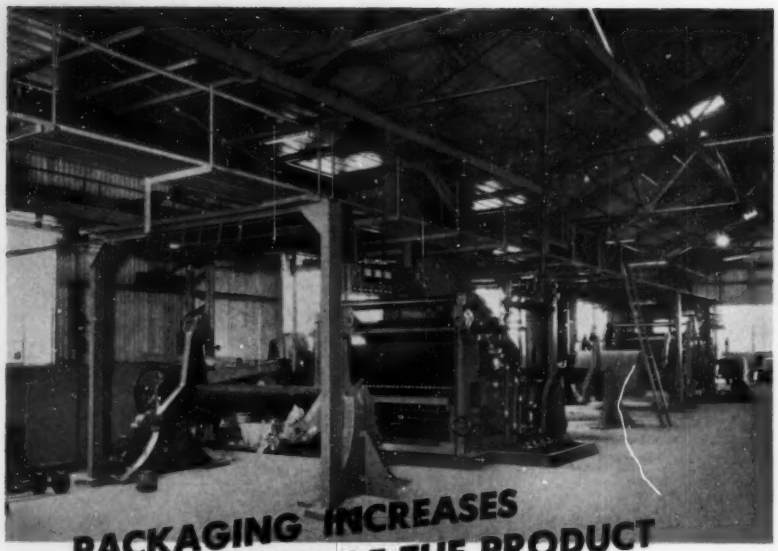
For the location of the WB-500 or other Inta-Roto laminator installations near you . . . for a demonstration in our plant . . . or information, write, call or wire today!

INTA-ROTO MACHINE CO., INC.

P. O. Box 454 Byrd Airport, Richmond 3, Va. Phone REpublic 7-4181

Canadian Representative: G. W. Keates,
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if you are particular about
QUALITY AND COSTS

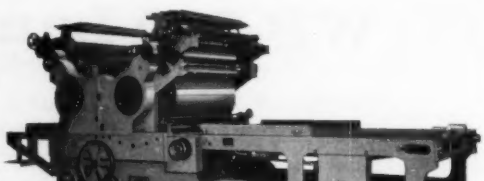
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Its simple operation guarantees efficiency

PERFECT YOUR PACKAGING with:

- Two Color Printer-Slotter
- Rotary Slotter-Creaser
- Rotary Slitter-Creaser
- Over-hung Slotter
- Bending Machine
- Semi-Automatic Wire Stitcher
- Wire Stitcher
- Bottom Wire Stitcher

Features: Double wall and/or double face
Heavy type.....120m max/min.
Delta type.....70m max/min.
Vertical .....30m max/min.



Two-Color Printing Machine



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P.O. Box 822, Tokyo Central Cable: MITSUI TOKYO

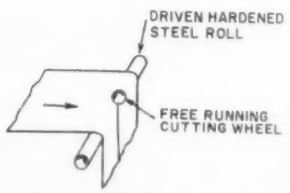
faster-moving backing webs. The latter may be paper, foil or another film. The method employs relatively low cost equipment as compared to extrusion laminating. The process requires films of special properties and formulations, but it can result in unique advantages.

Recent developments in packaging have indicated a tremendous increase in the use of laminated materials. Variety in plastic films, extended range of qualities of aluminum foils and development of paper-product packaging containers are creating new uses that tax the capacity of laminating equipment designers. Production speeds of 1,000 to 2,000 feet per minute are no longer in the future. Aluminum foil will be available in wider widths and in thickness approximately one half the current minimum of 0.00035 in.

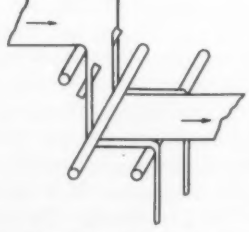
Slitting process

There are three basic processes in general use in slitting equipment: *knife cut, shear cut,* and *score cut.*

Knife cut. The first process, the most simple, is the free knife or razor blade unit. This arrangement may include a roll in advance and a roll following the slitting knife to support the web at the knife. Alternately the web may be supported directly at the knife edge by permitting it to operate



Pressure blade slitting



Free knife slitting

in a slot in a supporting roll or bar. This process is used principally for plastic films. It is customary to oscil-

BECK *keeps your production moving with*

these versatile machines

SHEET CUTTERS
for Paper, Board, Metals*

H—Economy model. For boxmakers, blue printers, makers of labels, greeting cards, gift wraps, stationery, etc.

HP—Production model. High pile for paper converters, manufactures of envelopes, folding boxes, file folders, pads and tablets.

HLP—High Volume model. High pile, high speed —versatility for any paper, board or metal converting.

for Films, Plastics*

HF—Standard model. For converters and printers of all films—cellophane, acetate, polyethylene, Pliofilm, etc.; makers of plastic tablecloths, drapes, window curtains, etc. HF also handles paper.

HF5—High Volume model. Same as HF but for high production.

HFA—High Volume model. Same as HF5 but provides angle cut for square sheets or parallelogram. Angle adjustment from square to 23 degrees.

*EE Photoelectric Cut-off Register Control available for cutting printed material accurately to register.

for Cloth

HT-Standard model. Cuts lengths up to 48". For bed sheets, pillowcases, towels, diapers—any textile product.

HTD—Universal model. Cuts lengths up to 130". For draperies, curtains, bed spreads—versatility for all textiles.

Special Materials

Model HD—For cutting delicately surfaced or hard-to-handle materials, such as photosensitized films, tissues, thick vinyls, felts, wadding, etc.

SLITTERS. RAZOR BLADE SLITTER AND REWINDER—High production unit for cellophane, acetate, plastics, foil laminates and a wide variety of fine materials.

SHEAR CUT SLITTER—Clean dust-free cutting with no edge distortion. Dual rewind and power rotary knives. Ideal for photographic paper.

SET-UP BOX LIDDER. Automatic high speed lidding or closing of set-up boxes, filled or empty.

CAN IMPRINTER. High quality printing of identification, grade, specifications and other variables on lithographed cans.

SHEETER-PRINTER. A complete production unit for combined cutting and imprinting of sample book sheets.

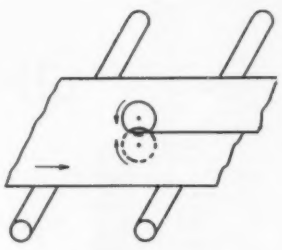
ENGRAVED ROLL PRINTER. A sheet fed unit providing high quality overall design printing from an engraved copper roll.

TEAR STRIPPER. High speed rotary cutoff and rotary heat seal application of tear strip to register with printing.

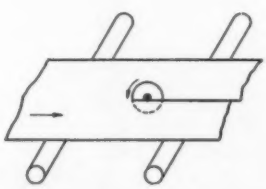
CHARLES BECK MACHINE CORPORATION
Church & Gulph Rds., King of Prussia, Pa.

late the knife in a plane perpendicular to the web travel to distribute wear on the length of the knife edge. A variation of this process uses a driven rotary blade to make the cut.

Shear cutting uses a pair of circular knives rotated together in a scissors action. Spring tension usually is applied to maintain proper scissors action between the blades.



Shear slitting



Rotary blade slitting

Score cutting is accomplished by pressure of a disk edge against a web supported by a hardened steel backing roll. The pressure of contact between the disk edge and the backing roll squeezes the web apart. Pressure which is required against the backing roll may be controlled either by spring or by air.

Sheeting process

The conversion of continuous webs to sheet form is basically the simple operation of transverse cutting. The cut may be made on rigid materials by means of a track-mounted rotary blade or saw. The rotary cutter usually moves on its track in a diagonal path of travel across the sheet so that it will result in a straight cut on the moving web.

The most common sheeting method used on flexible webs is a scissors or shear cut by means of a cutting knife delivered in contact with the sheet from one edge to the other. This cutting action is made against an opposing knife edge or bed plate supporting

LOW COST
Vacuum Forming
in your own plant



Now, for a minimum investment you can control your own production – produce blister packages, displays, 3-D letters, toys and many other vacuum-formed products. The Model 300A, illustrated, utilizes a wide range of thermoplastic materials – vinyls, styrene, polyethylene, butyrate, acetate, in sheets or rolls. No special training is required and changeover from one mold to another takes only minutes. You enjoy the flexibility that comes only with control of your own supply.

LOW-COST MOLD-MAKING FACILITIES AVAILABLE

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NEED HELP IN DESIGNING VACUUM FORMED PACKAGES

Our blister packaging experts can offer sound technical help with your blister packaging problems.

WRITE FOR COMPLETE INFORMATION

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Mitchell 3-6760

Big opportunity to make money in packaging

GARAGE-storage, $10. JU 6-2665

218—Business Opportunities

EXPERT engineering staff seeking sales-conscious, cost-conscious, imaginative management to investigate amazing Poly-Tite (R) protective packaging methods. Service, equipment and materials presently available nationally. Now in use at such diversified companies as:

Lenkurt Electric Co., Inc.
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Aerojet General
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Sylvania Electric
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Write for full details of this surprisingly low-cost skin packaging equipment. Poly-Tite (R) Model Series 600 and 700 custom tailored to your needs at a mass-produced price. Platen sizes up to 36" x 36". Recommended for production-line operation. Poly-Tite (R) Models C-14 and C-18, 14" x 24" or 18" x 24" platen size. Recommended where individual packaging and low volume are factors. Poly-Tite (R) Model 500B. 14" x 18" platen area. **Completely portable with built-in dolly.**

Weight 150 lbs. for use where portability is desired.

A highly-trained staff is anxious to work with you. Contact us for Sample Skin Packaging of your products.

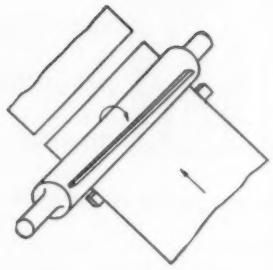
MfP Division

Avery

Industries, Inc.

Box 1553, San Mateo, California

BAR—1 owner, same downtown location 40 years. Good neigh



Rotary or flying shear

the web at the line of cut. Some equipment is constructed with straight knife edges perpendicular to the edge of the sheet. Such cutting assembly may be used either in stationary position with a momentary halting of web progress, or it may be made by moving the cutting assembly with the web at the web speed of travel.

Another shear-cut sheeting process employs a spiral knife revolved about an axis above the sheet and with a mating knife against the under side of the sheet. The angle of spiral or lead of the knife is determined by the speed of web travel and by the rate of revolution of the cutting blade.

After the sheets have been cut from the moving web they usually are carried by acceleration tapes or similar conveyors to a location for stacking. The accelerated sheet travel permits a spacing between the sheets to facilitate the stacking operation.

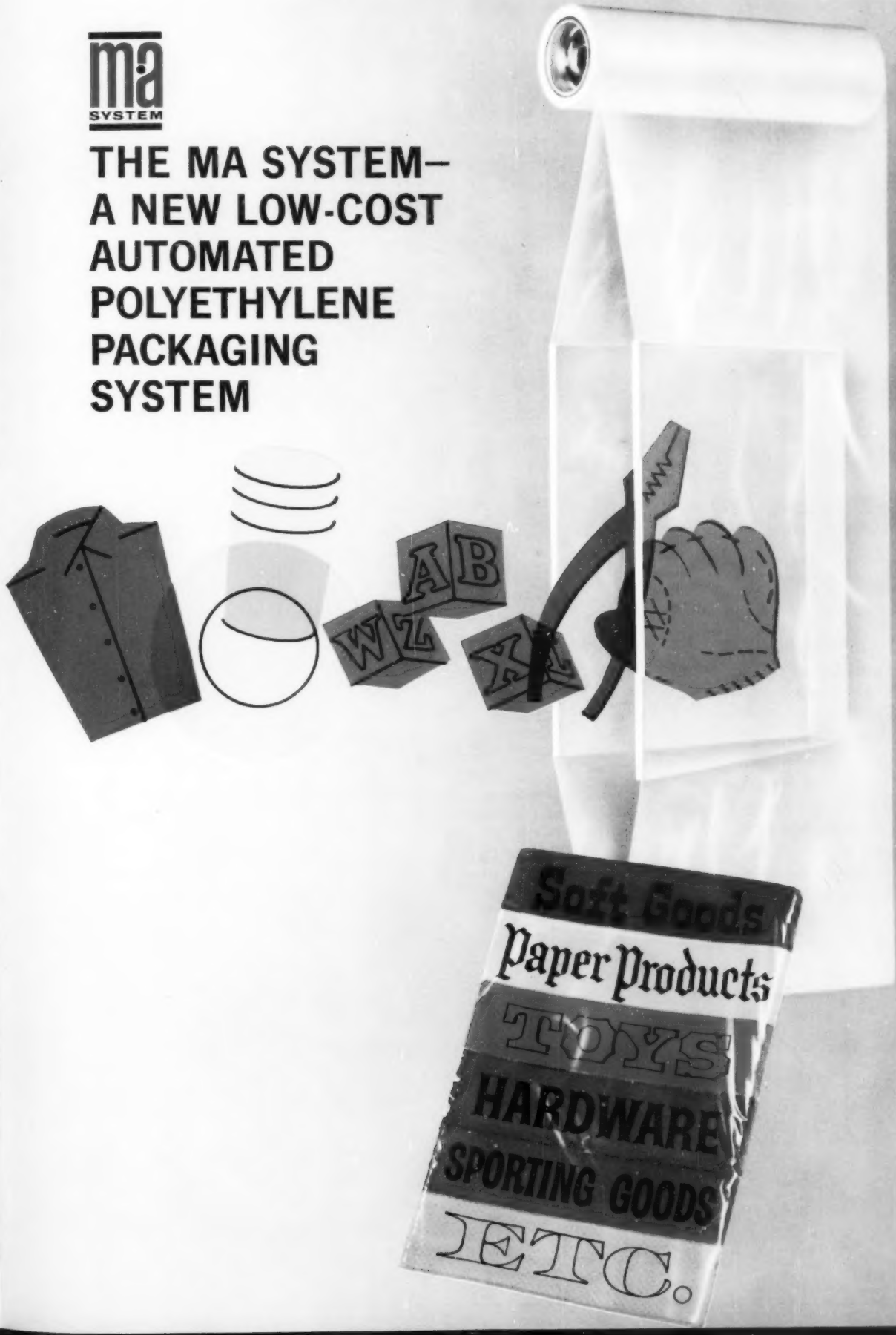
Accessories

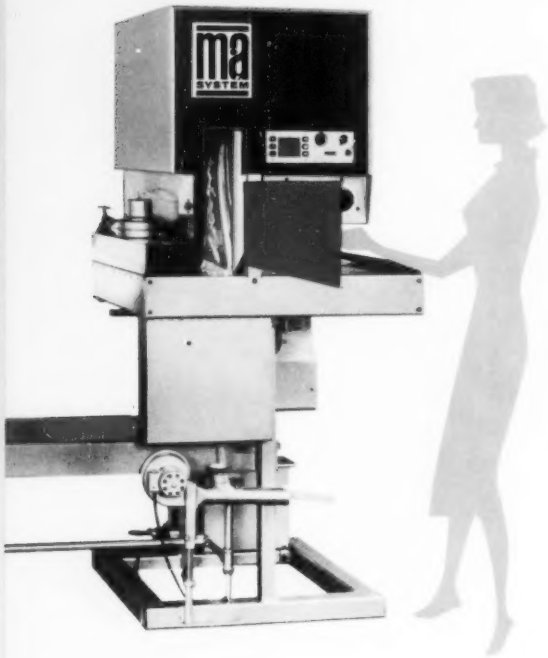
In handling continuous web materials through a process many items of accessory equipment are required: unrolls, web guides, tension controls, wrinkle eliminators, static eliminators, cooling drums, continuous weight indicators, trim removal sections, conveyors, rewinds, temperature and humidity controls, and coordinated driving equipment. Frequently printing, embossing or perforating equipment is also set up as a tandem operation.

An adequate description of these accessories and a guide to their proper selection cannot be presented in a brief summary. It should be noted, however, that current requirements for packaging materials and the increasing attention to establishment of firm specifications, especially by vertical convertors who are prime producers of paper, foil and film, often demand that these process refinements be used.

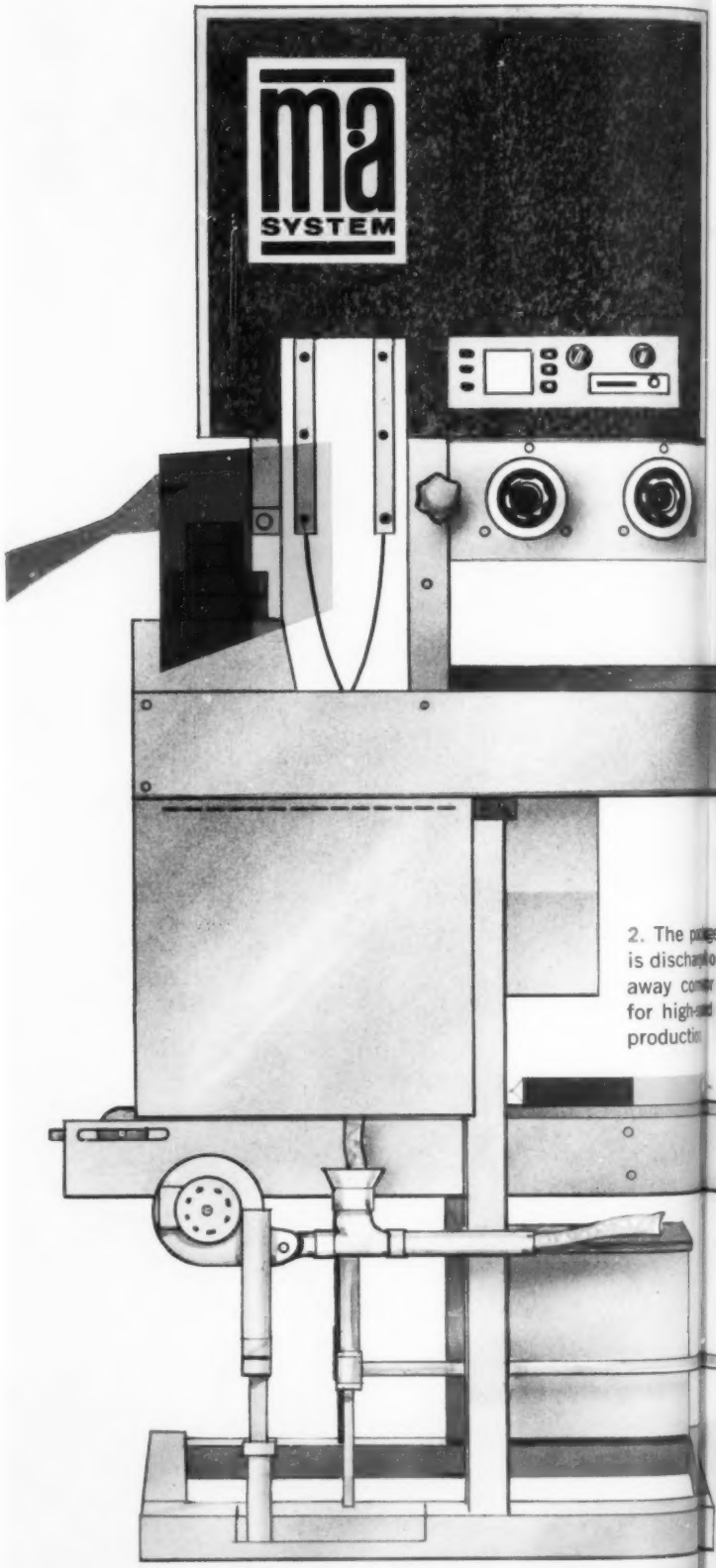
ma
SYSTEM

THE MA SYSTEM– A NEW LOW-COST AUTOMATED POLYETHYLENE PACKAGING SYSTEM





PROFITABLE POLYETHYL



1. The
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MA Sys
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THE MA SYSTEM*

- Completely packages products in polyethylene film—in one operation—in your plant. If you are now using polyethylene you can do it cheaper; if you are not—look at the advantages.
- Produces inexpensive, loose or shrink-fit polyethylene packages around regular, odd-shaped or outsized products of all types, sealed three or four sides.
- Uses economical polyethylene roll stock—you don't need fabricated bags.
- Saves up to 50% in material costs over ready-made bags and other packaging methods and materials.
- Boosts in-plant packaging efficiency; produces up to 30 packages per minute. Users report labor savings in all cases.
- Provides a self-selling plain or printed package that protects, displays and glamourizes.

*PATENTS PENDING

OPTIONAL ACCESSORIES FOR THE MA SYSTEM

END SEAL ATTACHMENT (seals the fourth side of the package.) ■ ELECTRIC EYE—for use with printed film. ■ REGISTER PERFORATOR—makes 1/4" hole punch in header at desired intervals in register, eliminates need for grommets. ■ SKIP-SLIT PERFORATOR—makes intermittent perforations across width of package at top or bottom, for easy opening. ■ ELECTRIC COUNTER—key lock reset; tamper proof.

ETHYLENE PACKAGING WITH THE MA SYSTEM

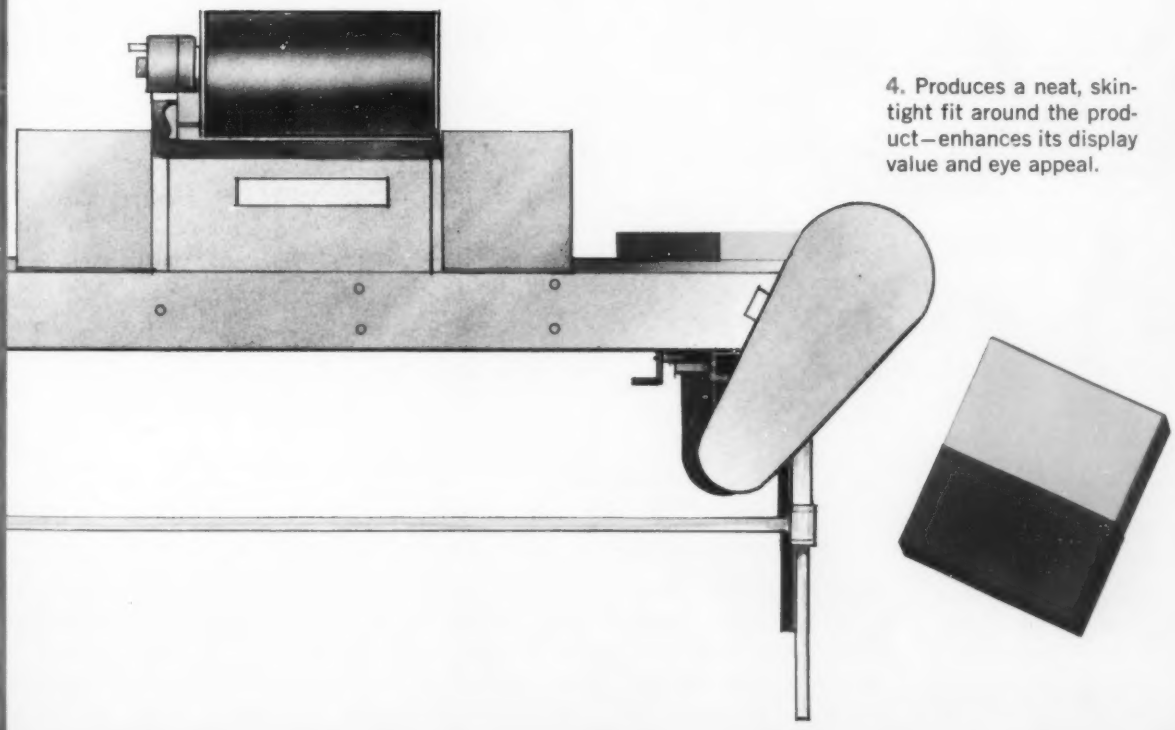
SPECIFICATIONS OF THE BASIC MA-70 POLYETHYLENE PACKAGING SYSTEM Overall height—80" • Overall width—36" • Overall depth—36" • Approximate weight—350 lbs. • Minimum bag width—1/2" plain, 3" printed • Maximum bag width—20"† • Minimum bag length—6" • Maximum bag length—20"† • Electrical supply—110 volts, AC • Maximum thickness of product to be packaged—5" • Minimum weight of product to be packaged—1½ oz. • Maximum weight of product to be packaged—4 lbs.† • Speed—up to 1800 packages an hour • Polyethylene thickness range—0.75 mil, minimum; 3.0 mil, maximum • Compressed air pressure range—90 lbs.—100 lbs. • Compressed air consumption—7.5 CF/M, minimum • Cost: Complete MA systems range from $2,300* for basic MA-70 Model to $5,000* with all accessories.

†Special MA Machines are available for packaging products of greater weight or dimensions. *Prices subject to change.

1. The MA System makes and seals a polyethylene package around a product in one fast, easy operation. Operator merely inserts product in open end of roll stock. The MA System can package and seal up to 1800 products per hour.

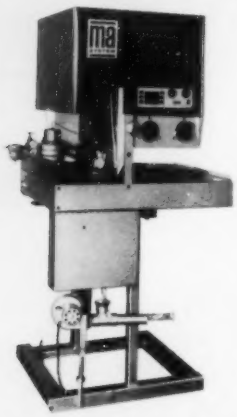
. The ...ged product ...s discha...onto a take-...way co...r (optional) ...or high-... automatic ...roductio...

3. To produce a contour fit around the product, a heat-shrink tunnel (optional) can be used in conjunction with shrinkable polyethylene film as an accessory to the MA System.

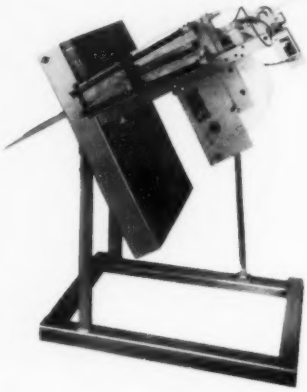


4. Produces a neat, skin-tight fit around the product—enhances its display value and eye appeal.

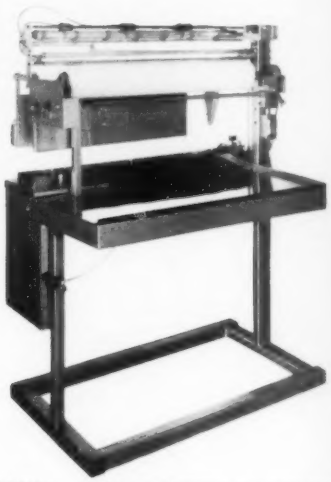
OTHER MODELS IN THE MA SYSTEM



MAJ-70 (Jumbo Size Polyethylene Packaging Model) ...for larger products up to 30" wide, up to 30" long and up to 5" thick. Approx. $2700.*



SLIDE PACK MAS-70...designed for easy packaging of produce and other items to be packed in open boxes or trays. Approx. $3300.*



MA SPECIAL...custom-engineered for extra-large or extra-heavy products. Prices based on requirements.



MAM-70 (Multiple Item Polyethylene Packaging Model)... makes contour packages for multiple items, small parts and granular substances. Approx. $2875.*



STAR PACK SF-2...lowest in price. Makes open-end package. Manually operated. Approx. $125.*



ROCKET SF-4...packages any item up to 4" thick, 20" x 20" length and width in open-end package. Electrically operated; semi-automatic. Approx. $700.*



GLOBE SF-3...packages odd shapes; cones, cylinders, and spheres in open-end package. Approx. $700.*



BENCH MODELS #3 AND #4...portable, plug in at bench, table, counter or shelf. Horizontal operation with or without fourth side seal; packages items up to 16" wide x 20" long. Approx. $285-$325.*

A staff of MA System engineers and package designers are available to consult with you about your packaging objectives. Any of several MA System Models can be custom-designed to meet your specific production problems.

*Prices subject to change.

ENTHUSIASTIC REPORTS FROM MA SYSTEM USERS

Baked Goods

"We used to use cellophane on another type of wrapping machine. We switched to the MA System and polyethylene packaging. We've saved 20% over cellophane and have increased our business by 25%."

—TOELLNER BAKING COMPANY
POPLAR BLUFF, MISSOURI

Housewares

"30% savings in material costs and a 75% reduction in labor costs as a result of the MA System."

—ROBINSON KNIFE COMPANY
SPRINGVILLE, NEW YORK

Paper Products

"The MA System gave us a more secure and durable package at one-half the cost of cellophane."

—SIMPSON PAPER COMPANY
EVERETTE, WASHINGTON

Industrial Components

"The MA System packaging method and technique are what really sold us on the use of polyethylene. We anticipate savings of 50% in materials alone, which can pay for the new packaging system within 12 months."

—SEYMOUR FILTER COMPANY
DIVISION OF CUMMINS ENGINE
COLUMBUS, INDIANA

Meats and Produce

"Economy, substantial savings on labor, and ease of packaging sold us on the MA System."

—TABLE MEAT SUPPLY COMPANY
OMAHA, NEBRASKA

Toys

"Stepped up sales appeal and reduction of pilferage were factors in choosing the MA System."

—DONALD F. DUNCAN, INC.
EVANSTON, ILLINOIS

Hardware

"Material costs have been cut 51%, we've opened up the chain market, and we need only half the packaging floor space we previously used."

—NATIONAL LOCK CO.
ROCKFORD, ILLINOIS

Soft Goods

"We expect the MA System to produce four times as many packages per operator per hour as our present machine, at 75% savings in labor."

—S. M. SOLTON COMPANY
LOS ANGELES, CALIFORNIA

Forms and Documents

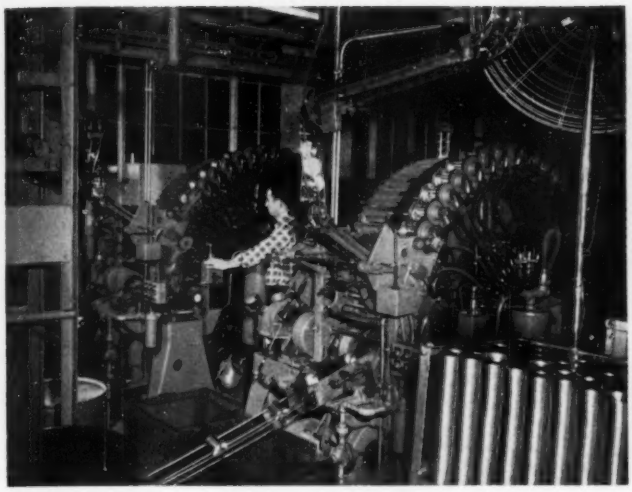
"Labor savings with the MA System have resulted in freeing two out of three people in our department to take on other duties."

—STATE FARM MUTUAL INSURANCE CO.
BLOOMINGTON, ILLINOIS

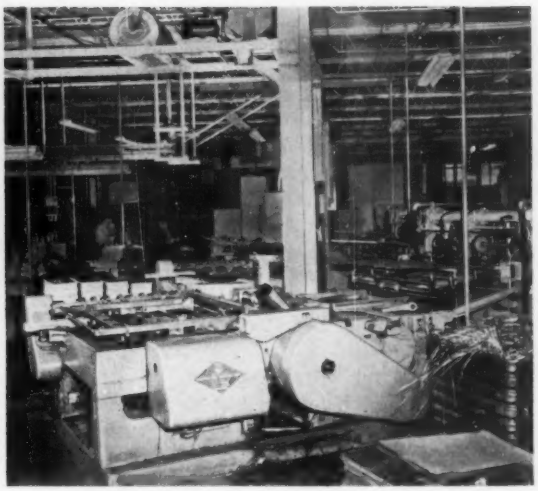
FREE OFFER

Let the MA System test-package your product in durable, transparent polyethylene. Send us a sample of your product, or write for additional details on this revolutionary packaging system to: Mehl Manufacturing Company, 2057 Reading Road, Cincinnati 2, Ohio.

ma SYSTEM



AIR TESTERS shown above are located at the end of two lines in the plant of the Hershey Chocolate Co., Hershey, Pa. Lines produce cans for chocolate syrup. *(Baldwin-Lima-Hamilton photo)*



DUPLEX SLITTER, foreground, is part of facilities of Sherwin-Williams Co., California, making cans for company use and for sale. *(Baldwin-Lima-Hamilton photo)*

In-plant can making

The trend to in-plant can manufacturing has been particluarly strong in recent years, and many large-volume consumers of metal cans now manufacture their own. Among high-volume users of sanitary cans who operate their own can-making lines are California Packing Co., Hawaiian Pineapple Co., Libbey, McNeil & Libbey, Campbell Soup Co., Producers Container Co. and Stokely Van Camp. Also, some food packers who require a relatively modest quantity of cans are producing them for their own consumption—for example, the M & R Dietetic Laboratory and the Hershey Chocolate Co.

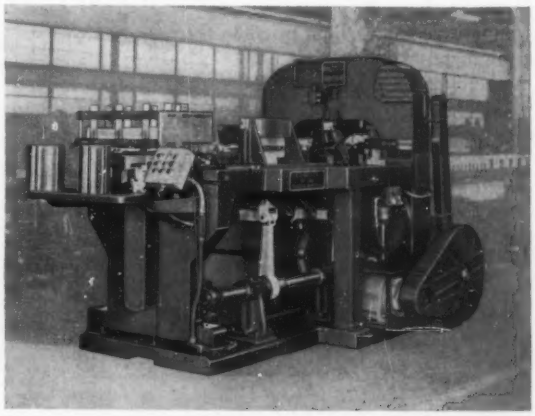
The burgeoning interest in aluminum cans has brought with it increased interest in in-plant fabrication. The three major types of aluminum cans being produced are (1) the extruded aluminum can, (2) the drawn can and (3) the three-piece can.

The *extruded aluminum can.* The low-cost automatic conversion of ingot into slugs at speeds up to 66,000 per hour is one of the keys to economic can manufacture at the Adolph Coors Co. in Golden, Colo.[1]

The *drawn can* is made much the same way as a variety of ordinary one-piece aluminum pots and pans. An installation at the Central States Can Corp. is, reportedly, producing cans at speeds up to 200 to 240 cans per min., depending on can size. One operator and one packer are required to run the entire line.

The *three-piece can.* This can is similar to the standard sanitary "tin" can which has been used for years with the basic difference that a sealing compound is used instead of a solder on the side seam. A new bodymaker for producing this type of can is currently making six complete lines for frozen juice concentrate cans (three-piece cans with cemented side seam and double seamed top and bottom).

There are a number of reasons why in-plant can-making facility is increasing. Basically it is because of the savings enjoyed by the elimination of freight charges attendant to receiving finished cans from the commercial can manufacturer. Can users who produce



HIGH SPEED of up to sixty 2- or 2½-gal rectangular cans a minute made possible by new design features: improved gauging, overhead clamp which positions and holds body blank at forming station, extremely smooth overhead cam drive. *(E. W. Bliss photo)*

1 See "New Advances in Aluminum-Canned Beer," MODERN PACKAGING, Feb., 1959, p. 90.

their own cans receive tin plate from the steel mill, shipped more economically than the finished can. Also, in many cases, the captive can company ties in its can-making line with the filling lines—resulting in a minimum required area for can storage. This, in turn, has been an attractive feature from the standpoint of utilization of floor space. Still other less significant factors encourage the can user to produce his own cans.

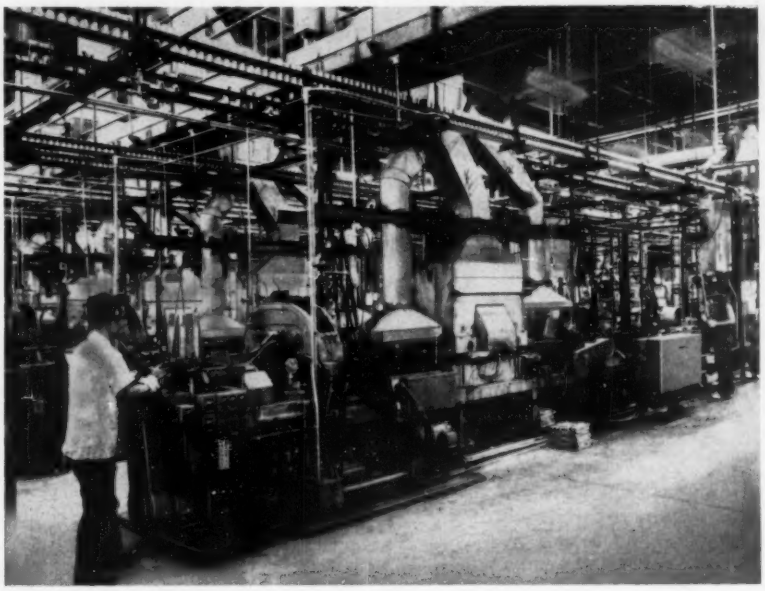
There are numerous factors to be considered in determining conditions warranting can production on the part of a can user since each has his own particular problems regarding can storage and freight charges. No one set of rules could apply as to whether or not it is "good business" for a food packer to produce his own cans. A rule-of-thumb guide for such consideration: Economic advantage occurs at about 40 million sanitary cans annually of a specific size. Significantly lesser volume is required to achieve this advantage where larger or irregular-shaped cans are used.

Around ten years ago, more than 75% of commercial can machinery sales reportedly was represented by purchases made by firms engaged in commercial can manufacture. Today approximately 80% of the sales enjoyed by the can machinery manufacturer results from orders received from captive can plants. Manufacturers of can machinery have reported sales increases up to 40% a year since 1957. Much of this increase is attributed to the growth of in-plant can making, it is said.

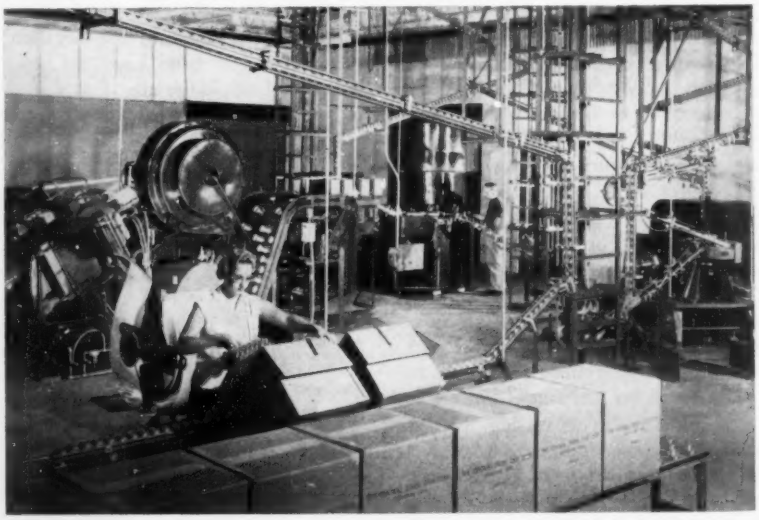
This sales volume increase has encouraged the can machinery manufacturers to develop, in their research and development centers, higher speeds and more efficient can-making equipment. At the same time, because of this volume, the can-machinery manufacturers have become increasingly competitive. The selling price on their equipment, therefore, has not been so markedly affected by the current inflationary spiral as to discourage food processors from taking advantage of the long-range savings by producing their own cans.

Can-making equipment on the market today is so productive that a typical captive can plant consisting of two sanitary can lines, operating two shifts daily, can produce 180 million cans annually. A typical can-making line consists of a slitter, bodymaker, flanger, beader, air tester, scroll sheer, strip-feed press and curler. The capital expenditure for the necessary can-making equipment for such an operation would approximate $600,000, excluding building costs. Savings resulting from in-plant manufacture of cans as compared with purchasing these cans from a commercial can maker, reportedly, may range from $4.50 per thousand to as high as $6.75 per thousand.

Major can-machinery manufacturers are prepared to present an inclusive study as to the feasibility of a user manufacturing his own cans. There are also independent can consultants, whose services are available to make complete surveys for a potential captive can maker. These surveys delve not only into the cost of the equipment but also into material costs, plant layout, labor rates and all other factors related to profitable in-plant can production.



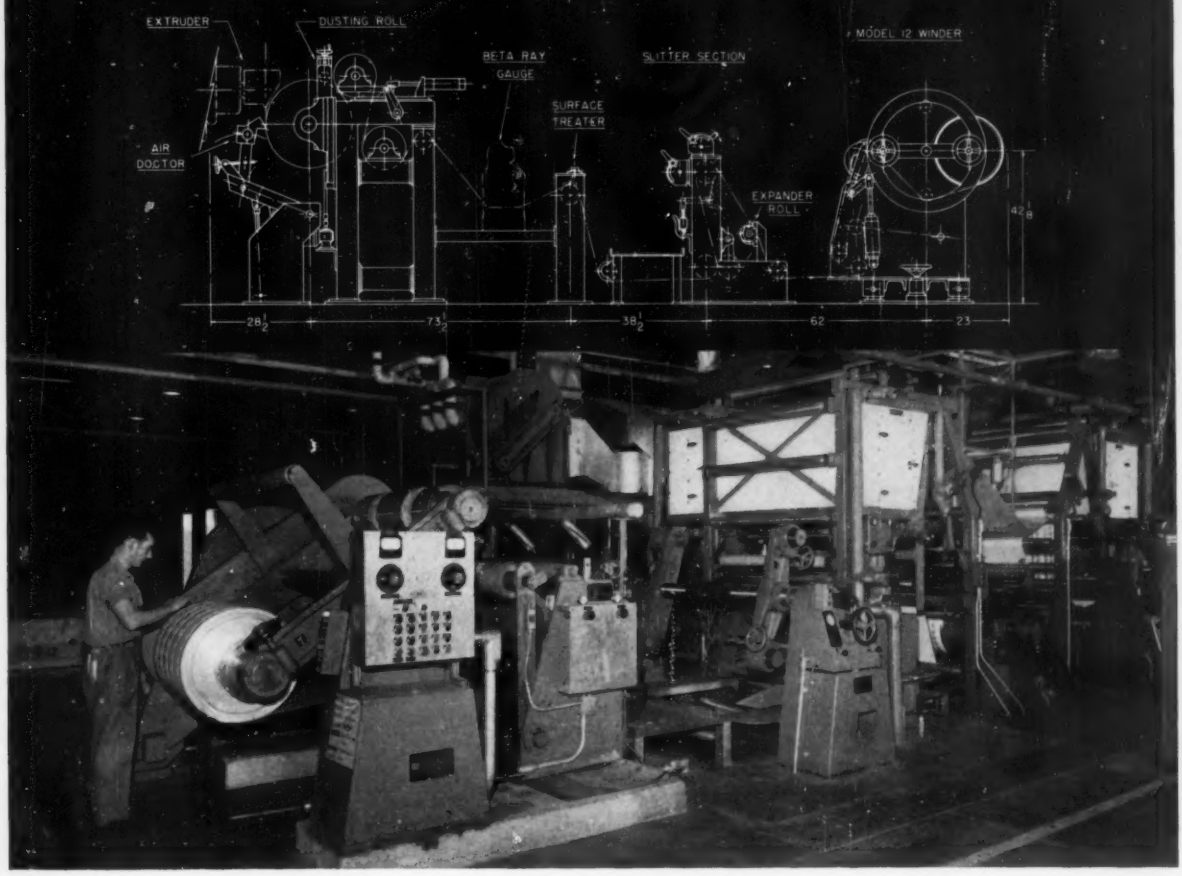
IN-PLANT CAN LINES of Hawaiian Pineapple Co. in Honolulu produce over 350 million cans annually at this particular location, on eight can-manufacturing lines. Operator is shown feeding blanks into body maker in foreground. *(Baldwin-Lima-Hamilton photo)*



TEAR-STRIP aluminum cans produced on line consisting of three major machines requiring only one operator and one packer. Can-size range: 208 by 108 to 307 by 306. Speeds: up to 200-240 cans a minute, depending on can size. *(E. W. Bliss photo)*

Complete "Package" Machine Lines

Extrusion Coating • Cast Film • Blown Tubing • Pelletizing



- Air Dryers, high or low velocity
- Drive and Control Equipment
- Extrusion Coaters and Laminators
- Laboratory & Pilot Plant Service
- Laminators, Polyethylene
- Slitter-Winders
- Take-Off and Cooling Drums
- Unwinds, continuous single, double or turret-type
- Winders, continuous surface and center type

Direct inquiries to The Black-Clawson Company, Dilts Division, Fulton, New York

- Devolatilizing Systems
- Dies, Mark V flat film, coating, sheeting blown film
- Extruders, Aetna-Standard induction-heated, up to 10,000 psi, 1½" to 8" screw, 20:1 to 29:1 L/D Ratio
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- Plastics Pelletizing Systems
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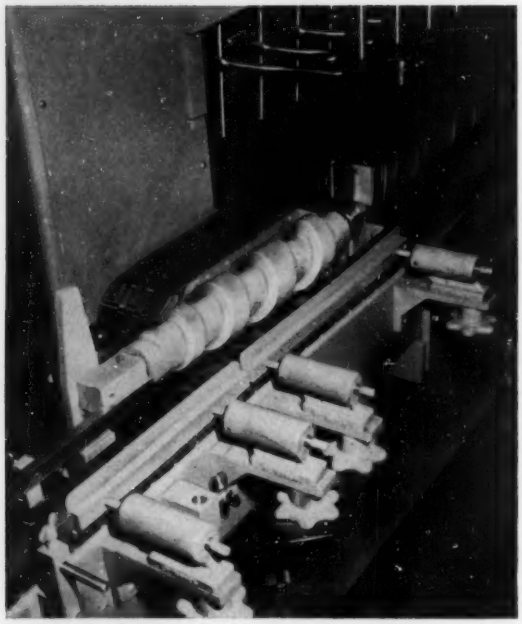
Direct inquiries to The Black-Clawson Company, Hale and Kullgren Plastics Dept., 613 Tallmadge Ave., Akron, Ohio

DILTS DIVISION
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CONVERT WITH CONFIDENCE

BLACK-CLAWSON

TIMING THE CONTAINER

By Lewis H. Kinsley*



SMOOTH, efficient in-feed of jars is controlled by the timing screw on this filling machine. Screw engages glass jars fed from conveyor and spaces them in correct position for sideways transfer under 10 filling nozzles, where jars are filled with cold cream. Jars do not contact each other and this prevents nicks or scratches that might lead to trouble later. (*Arthur Colton photo*)

With the trend toward higher speeds in modern packaging lines, the need for a smooth and foolproof device to feed each machine has become increasingly important to the industry.

More and more machine builders and also packagers have added feed screws ahead of the star wheels to assure proper timing of containers into these star wheels.

Feed screws are known by many names. They have been called feedworms, timing screws, helixes. (See Figure 1.) They have been made from many materials: namely, aluminum, brass, stainless steel, resin-bonded laminates and hardwood.

The paper-grade or linen-grade laminates have proved the best for a very important reason. The material is hard and it wears very well, but it will not scratch glass jars, nor will it scar the labels or lithographed designs on cans.

Gradually manufacturers are using fewer metal-timing screws and are changing to the laminates. Glass company research has proved that even microscopic scratches on glass containers can cause a future fracture point on the container so that potential breakage can occur farther along the line or while the package is on the way to the consumer.

One of the most important considerations in the design and manufacture of feed-worms or timing screws is to arrange the initial thread lead so that a smooth pickup and acceleration results. This can be done by cutting each screw to fit the specific container instead of having the container fit a standard range of thread patterns. At lower speeds on round containers some variation can be tolerated; this is not true, however, in the case of rectangular or flask-shaped bottles or jars.

The ability to separate and smoothly accelerate each container eliminates

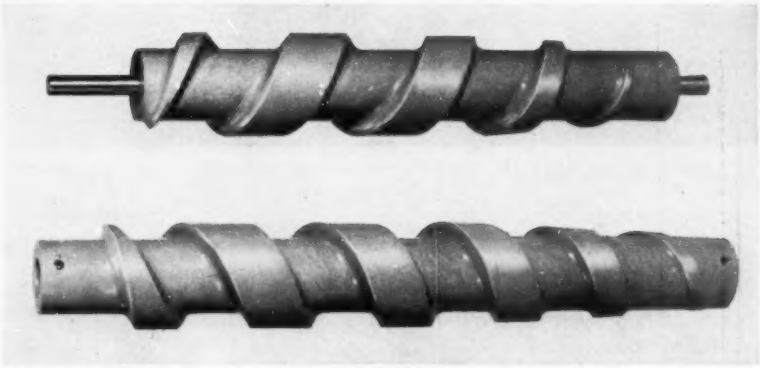


FIGURE 1

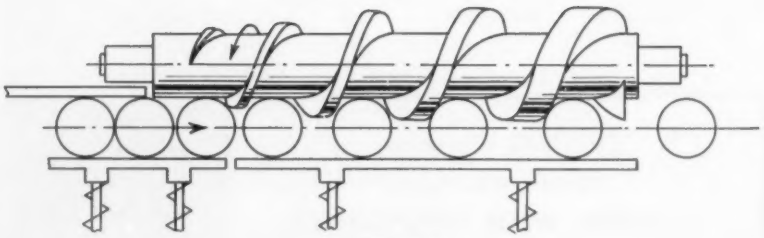
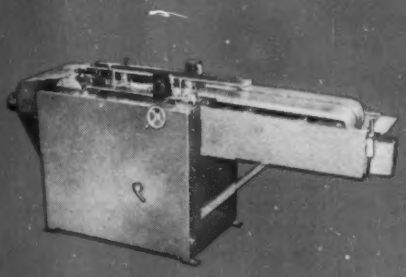


FIGURE 2

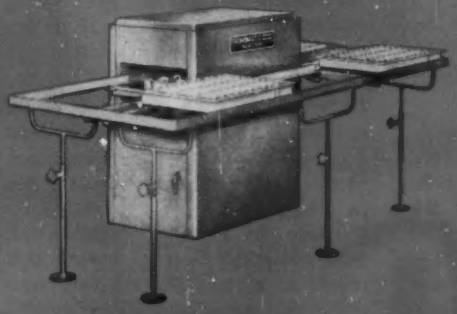
*Chief Engineer, Packaging Machinery, Arthur Colton Co., Detroit, Mich.

For the NEWEST in PACKAGING & PLASTIC EQUIPMENT

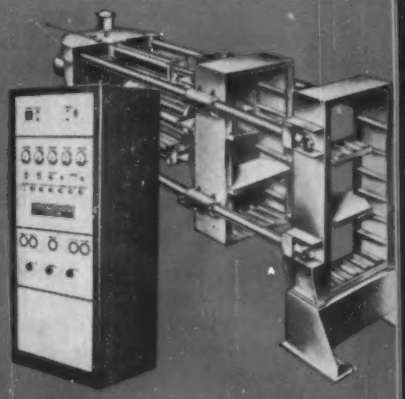
SLIDE PACKAGE FLANGE FORMER



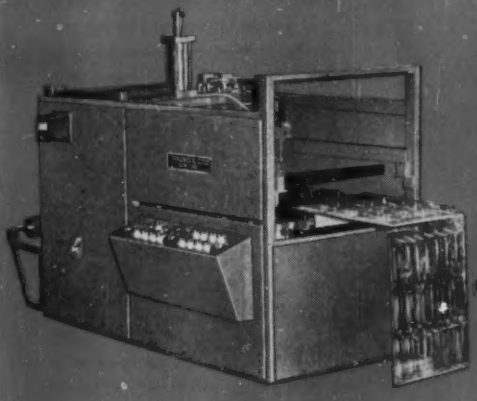
BLISTPAK HEAT SEALER



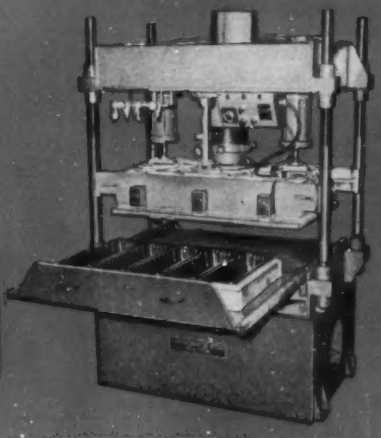
EXPANDABLE POLYSTYRENE MOLDER



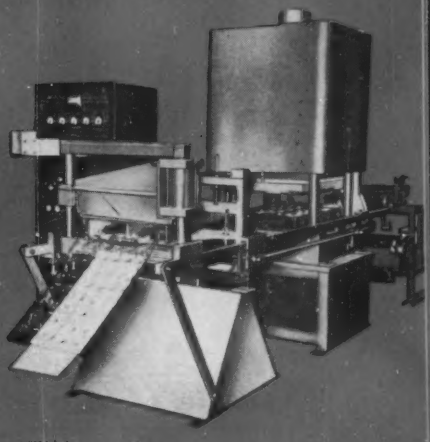
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unnecessary bumping and consequently prevents container nicks or chips which bumping may cause. At the same time, it lowers the noise level in the line. Smooth separation, pickup and acceleration can be designed into each application. The thread form should suit the container and the application.

In the more popular screw designs in use, the root diameter remains constant with the thread starting from "O" at the root diameter, and the thread form grows larger until it reaches a mixmum which is the outside diameter. This design allows a container to continue in the same straight line right through the timing screw (refer to Figure 2) along the root surface.

It is unnecessary for the container to slide sideways on the conveyor as it enters the important infeed end of the screw. This design also works with a straight backup bar, which for some applications can and should be spring loaded and made in two sections. For random feeding of round containers the first section of bar will be depressed in the event of a jar reaching the first part of the thread on dead center. The jar will slip ahead and feed smoothly through without a jam or break.

When the package is rather tall compared with its cross section, this results in an unstable handling condition, but special threads can be developed so that a second point of contact is incorporated in the timing screw design. Figure 3 shows this particular development.



FIGURE 3

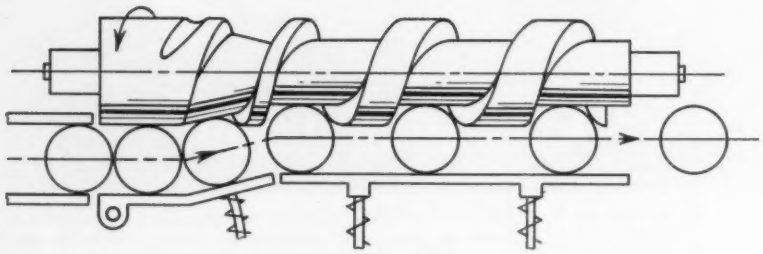


FIGURE 4

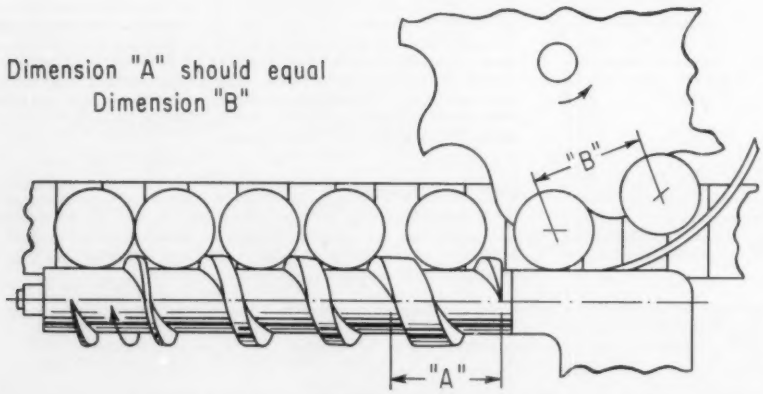


FIGURE 5

Another design of feed worm in use is manufactured with a constant outside diameter. In this form the groove starts at "O" and grows deeper until the root diameter is reached, thus creating the thread form. (Refer to Figure 4.)

In this design the container is separated in the initial groove and is accelerated as it reaches and continues along the root diameter. Because the container starts into the screw on the outside diameter and slides sideways as it reaches the root diameter, a bent backup is required.

Where a star wheel is to be fed by a timing screw, the center-to-center distance of the star-wheel pockets (Figure 5) must be equal to the final wrap or pitch of the feed screw. In addition to this, the conveyor should travel this same distance during the time that the feed screw takes to make one revolution.

Timing into a star wheel allows, however, a slight latitude in conveyor travel. Sometimes the conveyor is designed to travel a little faster than the thread pitch distance mentioned previously. However, this conveyor travel should never be less than the pitch distance during one revolution of the feed screw.

When feeding a machine where discharge spacing on a conveyor is desired, the final pitch or wrap of the thread form should be equal to the center-to-center distance desired. Also, the conveyor should travel this same distance while the feed screw makes one revolution This causes the container always to follow the forward side of the thread form. Because of this action, containers can be picked up at random by the feed screw and they always will be discharged on the timed increment spacing as they come out of the screw.

Another application where timing screws have worked to advantage is in packaging units where the screw is used not only to separate and accelerate the container but also to attain a controlled and uniform speed. This particular type of design allows tracking of the container for applying a band or any such packaging operation requirement.

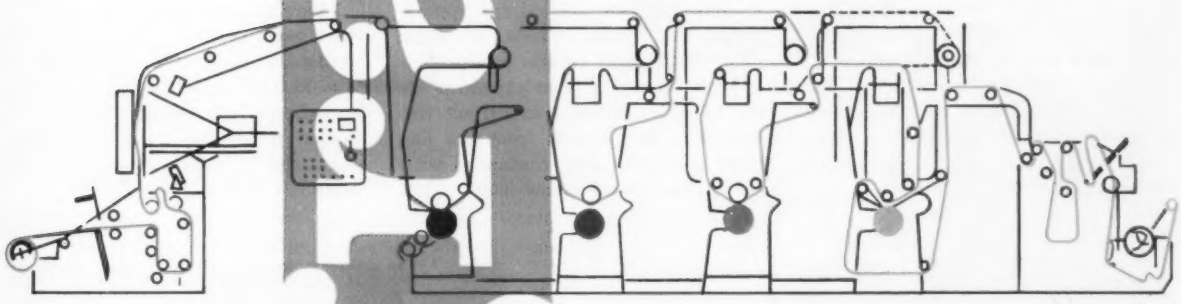
In many high-speed packaging lines timing screws reach from the discharge of one machine to the infeed of the next. When this procedure is used, timing control is maintained throughout the operation and smooth, trouble-free feed results.

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Capsules—types and uses

The capsule is a miniature package form popularly used for unit dosages of ethical drugs and vitamins and for other small-unit products which have a need for an inexpensive but sanitary container.

In addition to many medical and veterinary medical applications, capsules have been used to package food-coloring and flavoring extracts, one-use quantities of concentrated toilet preparations like soap, scented bath and shampoo oils, mosquito repellents, dyes, lubricating oils, adhesives and cold-weather engine-starting fluid.

Capsules are made of gelatin, which is edible and readily soluble in water. There are two principal forms: (1) the soft-gelatin type and (2) the hard, two-piece shape, often preferred for powders, which consists of two cylinders, each having a rounded end and an open end.

Hard-shell two-piece capsules are manufactured in stock sizes and may be made as small as 1.5 gr. or up to 1 oz. in capacity. They are always the same shape regardless of size, with graduated lengths and diameters allowing for different quantities of the dosage. They do not require a complete fill and they lend themselves to hand filling. They are in widespread use by the corner druggist.

The soft capsules may be made in almost any shape – oval, round, elongated or tapered at one end—and come in sizes from 1 minim, packaging not much more than a drop of liquid, up to 1 oz. Labeling for brand name, contents or instructions is practical in the larger sizes, utilizing decalcomania, printing or embossing.

Gelatin suffers practically no reaction with most chemicals. Nevertheless, it is important for the capsule manufacturer (who, incidentally, is also the filler) to know the compatibility of the active ingredients in the product with the gelatin, so that the capsulated dosage will remain stable between packaging and use.

Color is often added to the gelatin before fabrication in a wide variety of shades. Certified dyes are used for this purpose in conformity with regulations of the Federal Food, Drug & Cosmetic Act. Color has value for both industrial and medical applications since it provides immediate identification and needed eye appeal. Some formulations screen out light rays which affect certain products.

Equal care has been expended on the capsule container to extract the utmost in eye appeal from the finished package. Glass containers with continuous-thread screw caps fitted with adequate cap liners afford superior protection, especially for the vitamin-type capsules.

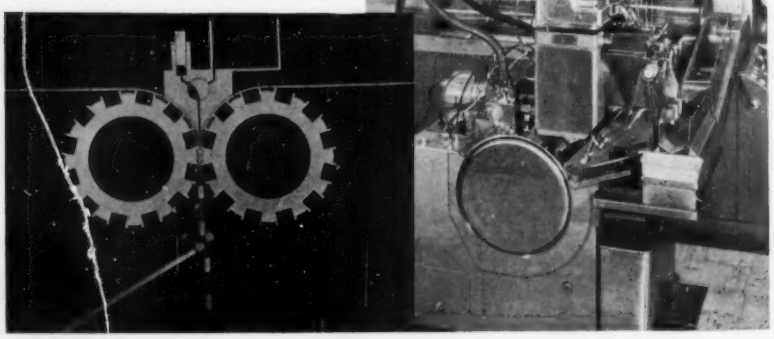
Two-piece capsules may be filled by hand or on machines, some of which can produce as many as 400,000 finished capsules a day. About 90% of the soft, elastic containers used for medical and vitamin products are made by the rotary-die process developed in the early thirties.

The rotary-die process is credited with transforming this old pharmaceutical dosage form, of limited usefulness, into one of the most precise and useful dosage-unit packages on the market. As typical of the precision with which filling now is done, one manufacturer reports a sample run of 268 units having an over-all variation of plus or minus 0.437% from the desired 250 milligrams. The mean was almost exactly halfway between 250 and 251 milligrams, with the largest 252 and the smallest at 248 milligrams and just one of each in the total run.

Many pharmaceutical houses contract some of their capsulated preparations to the capsule manufacturer, who has on hand or available all the ingredients that will go into the particular brand. On his own premises, the capsule maker compounds the formula exactly as specified.

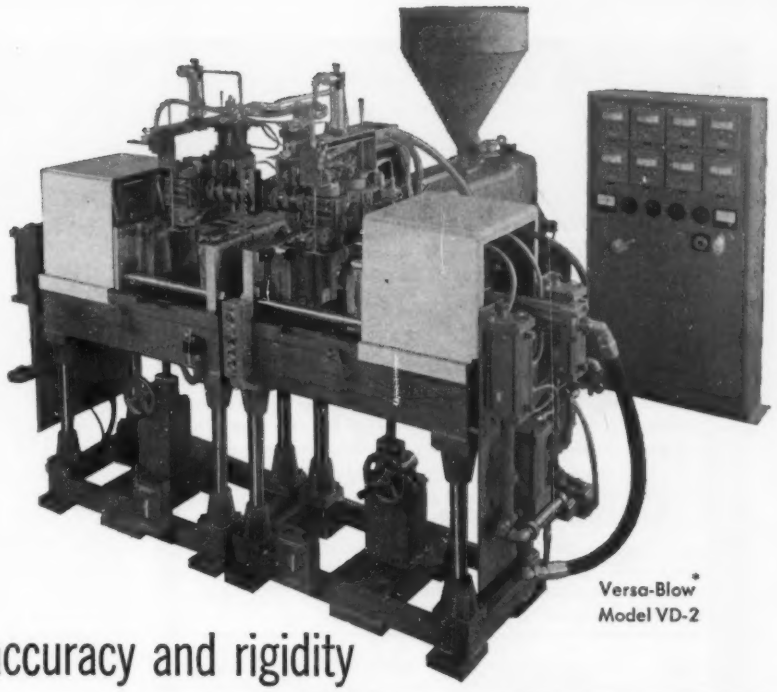


BANDING MACHINE seals hard capsules by applying ⅛-in. wide gelatin band at rates to 200 per min. *(Arthur Colton photo)*



FILL MATERIAL is pumped through V-shaped wedge (see inset); two revolving dies with ribbons of gelatin over them receive expelled fill material; capsules are formed and weld sealed. The complete capsules then drop out. *(R. P. Scherer Corp. photo and diagram)*

PRODUCTO BLOW MOLDING MACHINES



Versa-Blow* Model VD-2

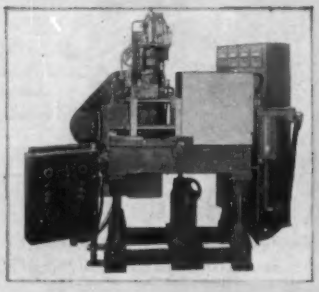
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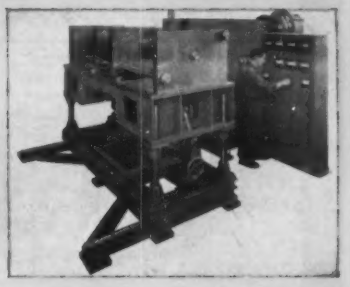
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- Each press also has positive, high-speed equalized opening and closing, insuring dead center mold alignment.
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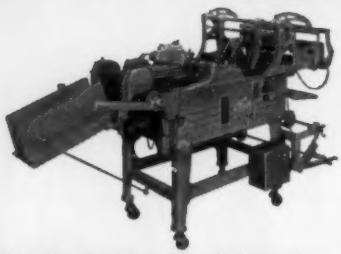
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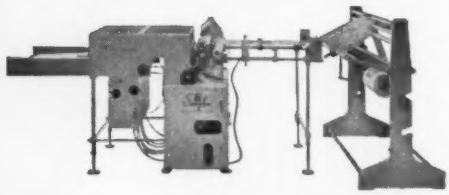
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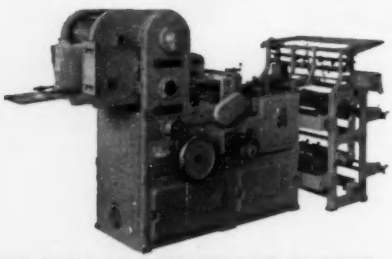


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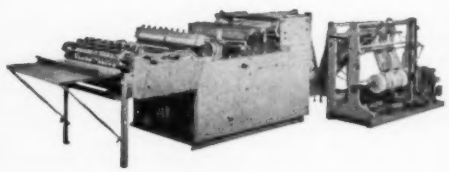


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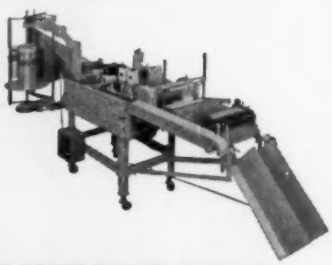
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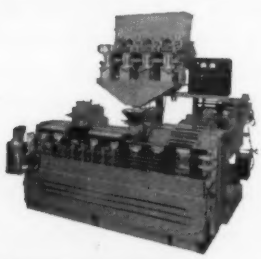
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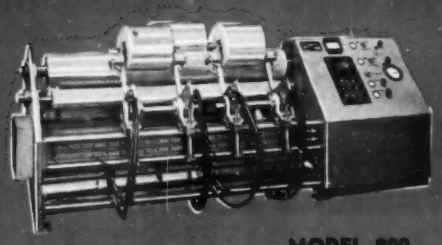
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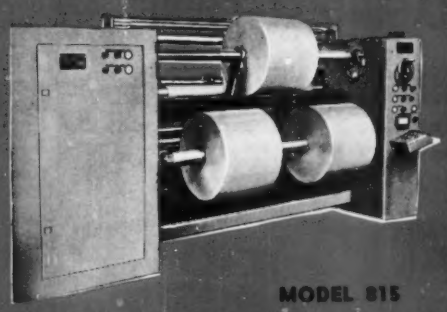
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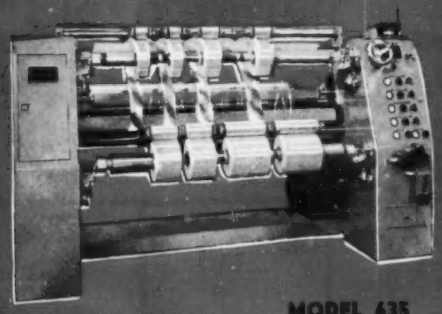
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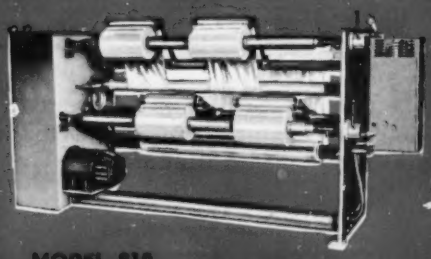
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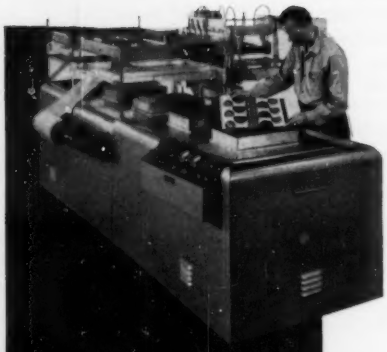
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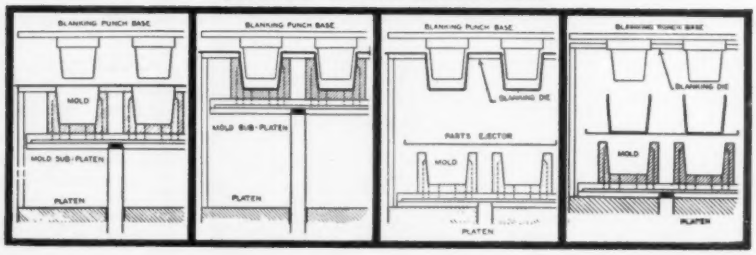


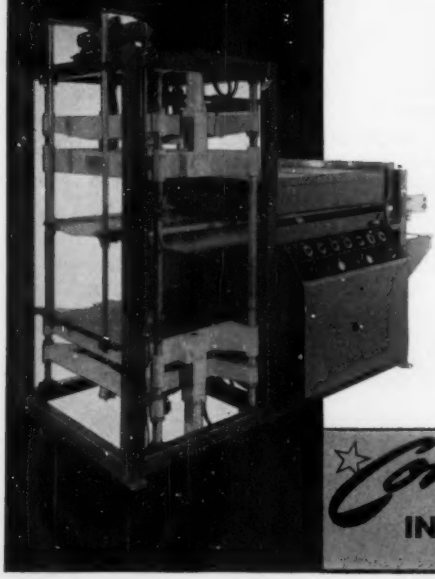
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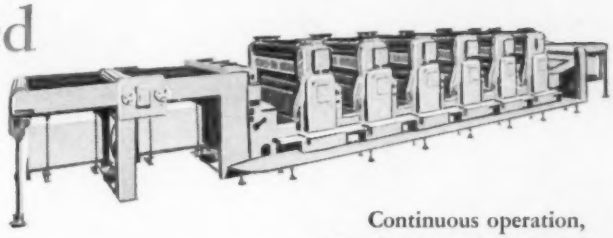
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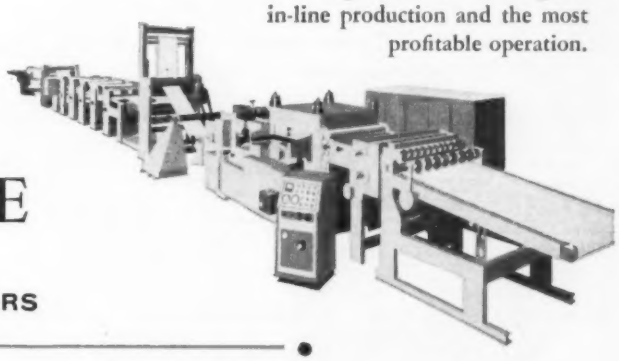


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MERCURY Web-Fed Flexographic and ROTOGRAVURE

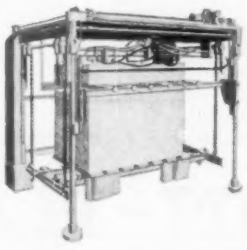
WEB-FED carton making machinery, engineered for the highest in-line production and the most profitable operation.



CUTTERS · CREASERS · STRIPPERS

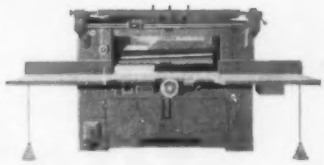
DEXTER Feeders

A complete line of efficient sheet feeders for board or paper.



LAWSON Trimmers

A full range of precision, high speed guillotine trimmers from 40″ through 69″. Multiple head drills, too.



M-D BLOWERS . . . Blowers and Pumps • FIDELITY INSTRUMENT . . . Drives and Controls

MIEHLE-GOSS-DEXTER, INCORPORATED
Chicago 8, Illinois

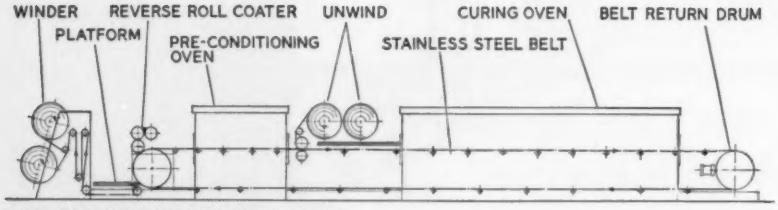
World's Largest Manufacturers of Printing Presses and Graphic Arts Machinery.



Waldron-Hartig Extrusion Coating Installation, Marvelum Co., Holyoke, Mass.

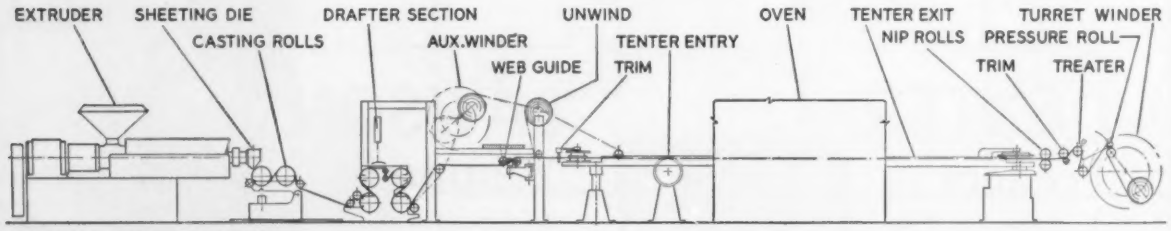
Integrated web process systems

for Coating, Laminating & Casting



CAST COATING LINE FOR VINYL FOAM

Complete line: standard unwinds, winds, coaters, laminators, embossers, extruders and ovens, especially combined for your exact needs. One source. One responsibility. Qualified representative available on call.



BI-AXIALLY ORIENTED FILM LINE

WALDRON-HARTIG

technical competence in web process machinery

WALDRON-HARTIG, Box 791, New Brunswick, N. J./a division of Midland-Ross Corporation

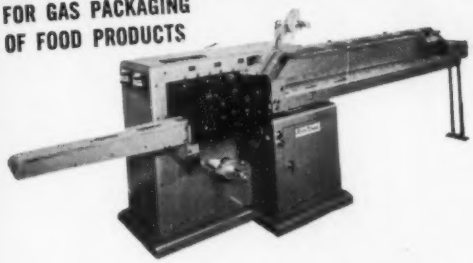
In Canada: A. R. Williams Machinery Co., Ltd., 69 Montcalm Ave., Toronto, Ontario, Canada

CONAPAC

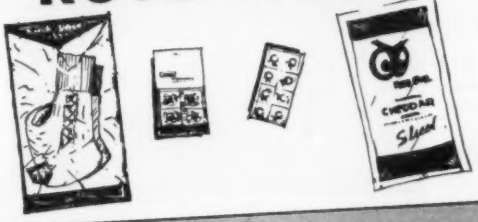
machinery for packaging

FOR UNIT and STRIP PACKAGING

FOR GAS PACKAGING
OF FOOD PRODUCTS



ROTO-WRAP



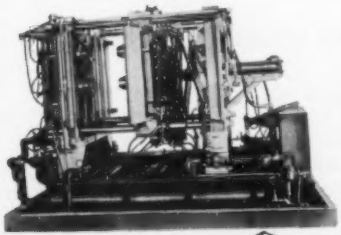
AUTOMATIC FORMING, FILLING & SEALING OF RIGID PLASTIC PACKAGES



FORMSEAL



FOR PROTECTIVE PACKAGING

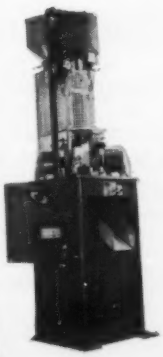


MILLER &
VAN WINKLE
AUTOMATIC MACHINERY
FOR EXPANDABLE
POLYSTYRENE MOLDING



FOR BLOW MOLDING

KAP
MACHINERY

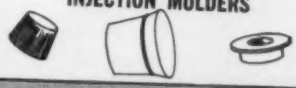




FOR CLOSURES AND CONTAINERS



ROTOJET
INJECTION MOLDERS

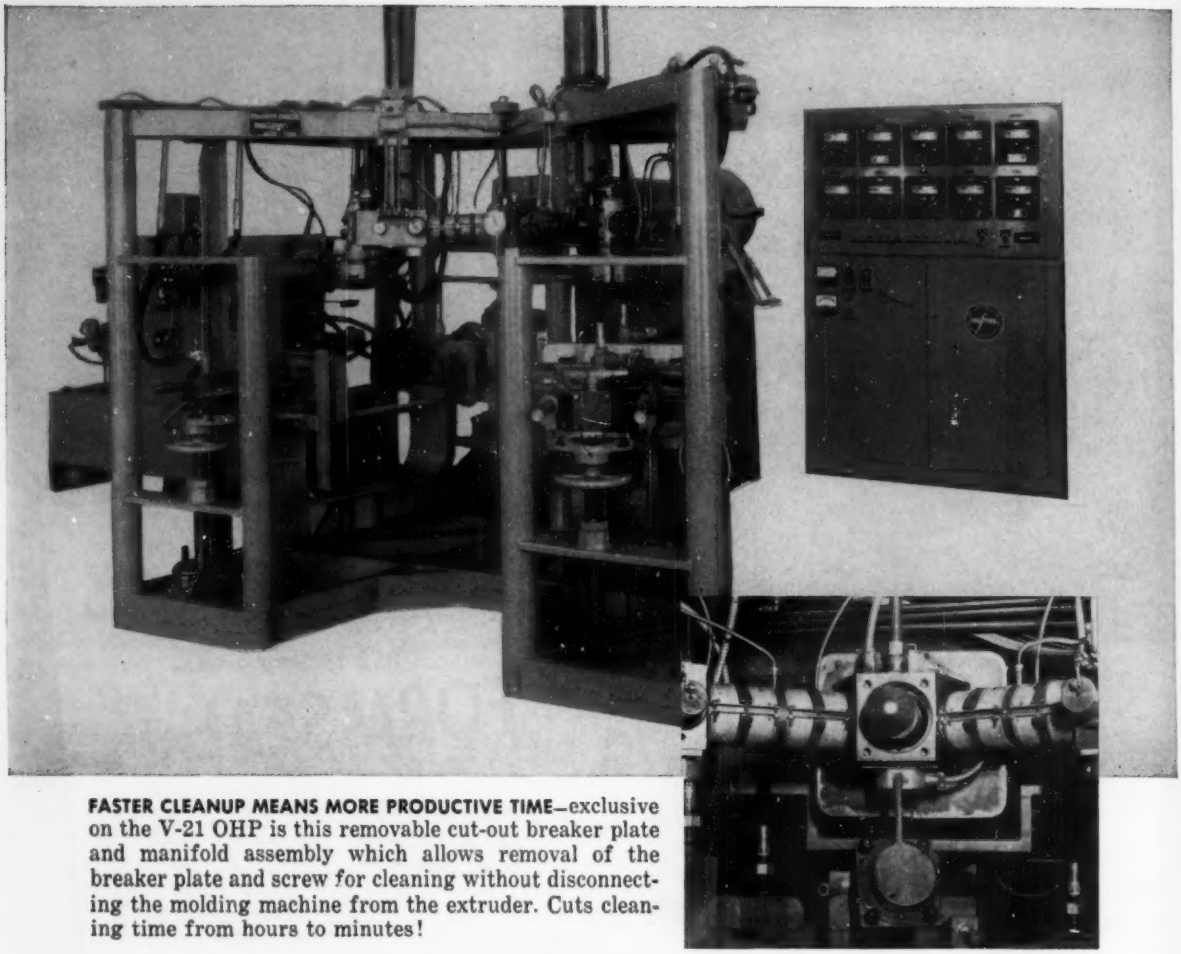


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Conapac

CONAPAC CORPORATION
Division of Roto American Corp.
120 East 13th Street • New York 13, N.Y. • SPring 7-6150

9581



FASTER CLEANUP MEANS MORE PRODUCTIVE TIME—exclusive on the V-21 OHP is this removable cut-out breaker plate and manifold assembly which allows removal of the breaker plate and screw for cleaning without disconnecting the molding machine from the extruder. Cuts cleaning time from hours to minutes!

FOR BLOW MOLDING, MPM'S MADE THE TWO STATION

V-21 OHP Diversamatic faster more versatile than ever!

WITH FULL HYDRAULIC OPERATION AND SEPARATE X-ALOY-LINED ACCUMULATOR FOR EACH STATION

HIGH SPEED FOR HIGH PERFORMANCE— Diversamatic's unique twin-station design almost doubles your production. As one station is cooling the other is extruding and forming, giving you continuous, uninterrupted operation. And, Diversamatic with multiple heads on each station has been production run at speeds up to 1,500 one-quart bottles per hour.

VERSATILITY FOR HIGH PERFORMANCE—Either identical or different molds can be run at the same time, making it possible for you to produce a *different* item on each of the two stations. You can use up to *four* heads on each station for even greater versatility—greater speed. Separate accumulators on each station assure you of highly accurate parison delivery.

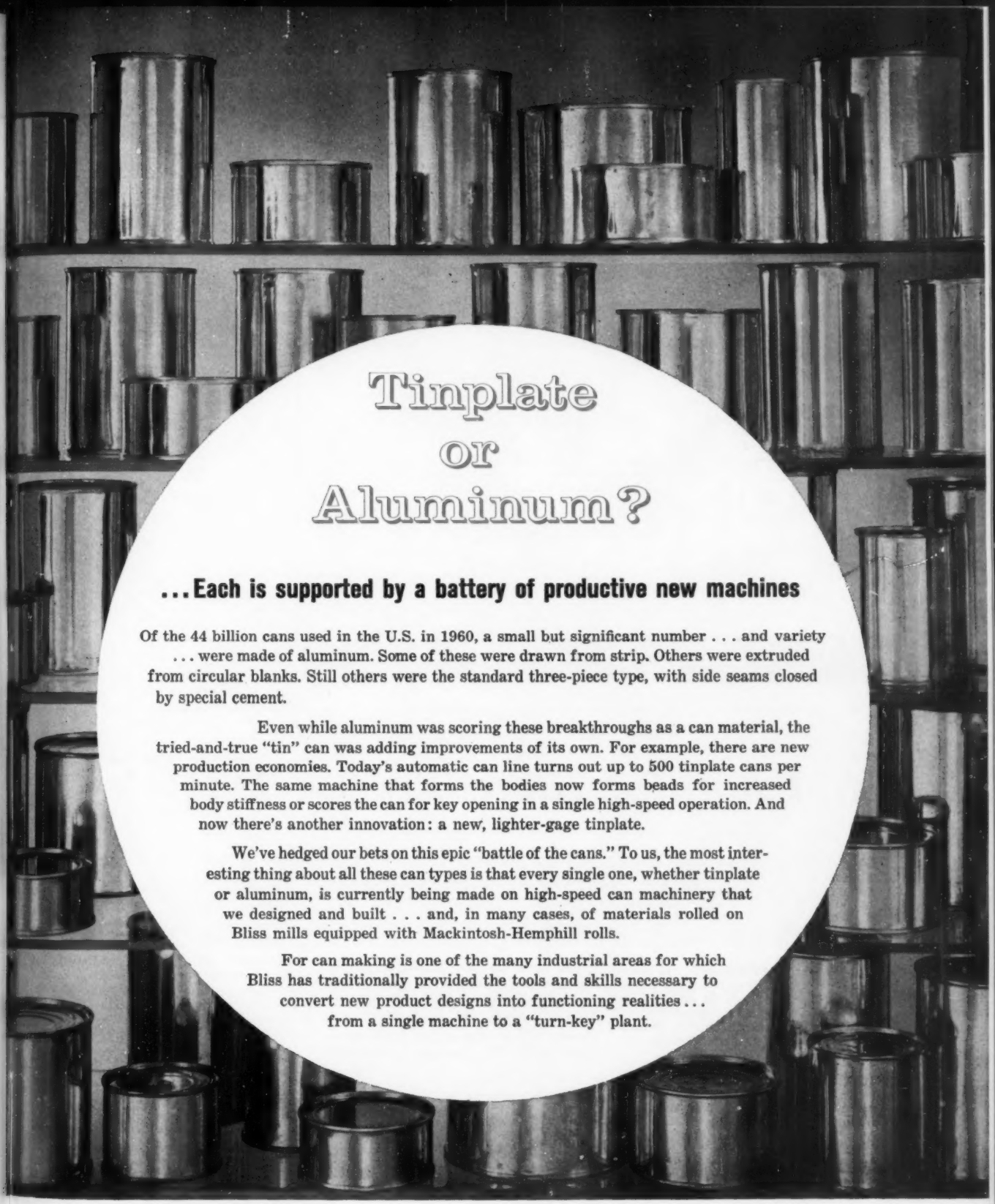
EASY OPERATION CUTS YOUR COSTS—Diversamatic is fully automatic, being controlled electronically by a nearby console. The machine also has manual controls for fast mold set-up and test runs. It requires minimum operator supervision, and is so simple to run that it is being operated by persons having no previous experience or knowledge in the plastics field.

MPM's COMPLETE MANUFACTURING FACILITIES— no mere assembler, MPM manufactures all its components, then pilot tests the completed unit. When you choose MPM, you can arrange to see your equipment in operation before it is shipped.

Write today for full information on MPM blow molding equipment. Manufactured under U.S. Patent 2980955. Other patents pending.

Modern Plastic Machinery Corp.

General offices and engineering laboratories: 64 Lakeview Avenue, Clifton, N. J.



Tinplate or Aluminum?

...Each is supported by a battery of productive new machines

Of the 44 billion cans used in the U.S. in 1960, a small but significant number . . . and variety . . . were made of aluminum. Some of these were drawn from strip. Others were extruded from circular blanks. Still others were the standard three-piece type, with side seams closed by special cement.

Even while aluminum was scoring these breakthroughs as a can material, the tried-and-true "tin" can was adding improvements of its own. For example, there are new production economies. Today's automatic can line turns out up to 500 tinplate cans per minute. The same machine that forms the bodies now forms beads for increased body stiffness or scores the can for key opening in a single high-speed operation. And now there's another innovation: a new, lighter-gage tinplate.

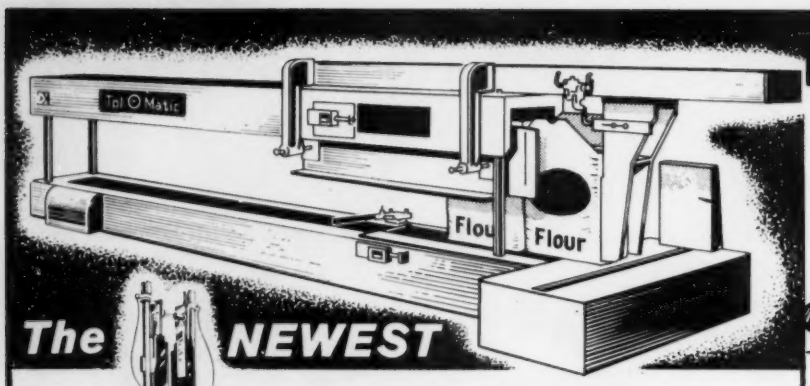
We've hedged our bets on this epic "battle of the cans." To us, the most interesting thing about all these can types is that every single one, whether tinplate or aluminum, is currently being made on high-speed can machinery that we designed and built . . . and, in many cases, of materials rolled on Bliss mills equipped with Mackintosh-Hemphill rolls.

For can making is one of the many industrial areas for which Bliss has traditionally provided the tools and skills necessary to convert new product designs into functioning realities . . . from a single machine to a "turn-key" plant.

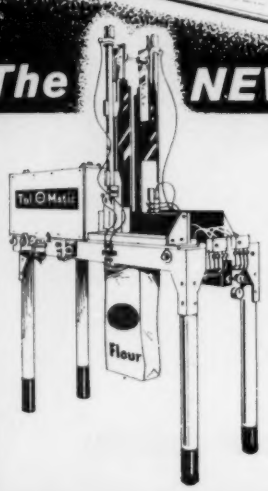
BLISS
SINCE 1857

E. W. BLISS COMPANY · Canton, Ohio

PRESSES · ROLLING MILLS · MILL ROLLS · CONTAINER MACHINERY · PUBLIC SAFETY



The NEWEST



Tol-O-Matic
PACKAGING DEVELOPMENT

Only one operator is required to assemble, pattern, bale and seal with this new TOL-O-MATIC Baler (at left) and Sealer (above).

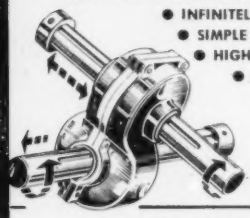
Quick, simple, screw adjustments handle both baling and sealing of package sizes from one to twenty-five pounds.

This package actuated TOL-O-MATIC combination is totally different in concept . . . extremely economical in operation. Complete information and engineering specifications are available upon request.

Tol-O-Matic, Inc. 246 Tenth Avenue So. Minneapolis 15, Minn.

THE LATEST PNEUMATIC AND POWER TRANSMISSION DEVICES

FLOAT-A-SHAFT
RIGHT ANGLE COUPLING



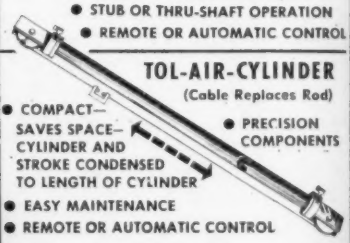
- INFINITELY ADJUSTABLE
- SIMPLE INSTALLATION
- HIGH HORSEPOWER
- LIGHT WEIGHT
- HIGH TORQUE
- COMPACT
- EASY TO MAINTAIN

TOL-AIR-CLUTCH



- RUGGED PRECISION CONSTRUCTION
- FAST RESPONSE
- HEAVY DUTY
- COMPACT
- HIGH TORQUE
- NO ADAPTION REQUIRED
- EXPLOSION PROOF
- STUB OR THRU-SHAFT OPERATION
- REMOTE OR AUTOMATIC CONTROL

TOL-AIR-CYLINDER
(Cable Replaces Rod)



- COMPACT— SAVES SPACE— CYLINDER AND STROKE CONDENSED TO LENGTH OF CYLINDER
- PRECISION COMPONENTS
- EASY MAINTENANCE
- REMOTE OR AUTOMATIC CONTROL

Get helpful literature . . . FREE!

FEEDING UNITS. 36-page catalog describes a line of electric heating units with components and other equipment. Includes cartridge, tubular, strip, ring and emersion types. Includes diagrams, specifications and prices. Vulcan Electric Company.

ULTRA-VIOLET ABSORBERS. 12-page bulletin describes and gives uses of a line of ultra-violet absorbers in clear coatings. Includes formulations, specifications, product data and list of supplies. Antara Chemicals, Div. of General Aniline and Film Corp.

PRINTING PAPER PLANNER. Comprehensive guide-wheel paper selector indicates stocks and weights best suited to particular printing jobs; literature, catalogues, etc., with grade selector for letterpress, offset, gravure, etc. Champion Paper & Fibre Co.

PLASTIC PACKAGES. Illustrated 8-page catalog of plastic packages manufactured from stock molds, many having features of interchangeable inserts for the covers. Gives size, materials, covers, colors. Manufacturer also equipped to meet specifications for special packages. E. B. Kingman Co.

All the booklets described here —plus hundreds and hundreds of others—are yours for the asking, entirely without cost or obligation.

Just turn to the Manufacturers' Literature Section (immediately preceding the Buyers' Directory), circle the numbers you want, fill in the reply post card, and mail. No postage is needed.

A service of

Modern Packaging
Encyclopedia Issue

A BRESKIN PUBLICATION

770 Lexington Ave., New York 21, N.Y.

GLUE GUN SYSTEM. 6-page folder illustrates and describes a line of fully automatic glue guns and accessories. Includes specifications and other data. John P. Fox Co., Inc.

CARTONS AND TRAYS MACHINERY. 8-page booklet and data sheet describes a carton and tray forming and gluing machine for fabricting heavy duty cartons. Illustrates special features and gives specifications. Peters Machinery Co.

STIFFNESS TESTER. 6-page brochure illustrates and gives description of a stiffness tester which evaluates both the stiffness and resilient qualities of materials. Includes specifications, accessories and prices. Taber Instrument Corp.

CUTTING AND CREASING PRESS. 4-page data bulletin illustrates and describes, in detail, an automatic die-cutting and creasing press which handles solid fibre as well as all types of corrugated board. Includes diagrams and specifications. S & S Corrugated Paper Machinery Co., Inc.



PERFORMANCE-PROVED

1. Gamse Lithographing Co., Inc., Baltimore, Md.
2. Reynolds Metals Co., Richmond, Va.
3. Federal Paper Board Co., Inc., New Haven, Conn.
4. Flexible Barriers, Inc., Stamford, Conn.
5. Kaiser Aluminum and Chemical Corp., Belpre, Ohio
6. Rap-In-Wax Company, Minneapolis, Minn.
7. KVP Sutherland Paper Company, Kalamazoo, Mich.
8. Thomas J. Lipton and Company, Inc., Hoboken, N. J.

Champlain web-fed printing and converting equipment has proved efficient and economical at these and many other prominent plants throughout the world. Write today on your company letterhead for the 216-page illustrated catalog describing the full Champlain line.

Champlain

Champlain Company, Inc., Harrison Avenue, Roseland, N. J.
Chicago Office: 58 Broadway, Des Plaines, Illinois
In Europe: Bobst-Champlain, S. A., Prilly-Lausanne, Switzerland

What in the world are you Sheeting?

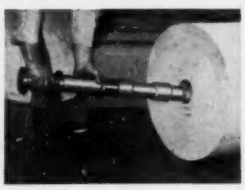
PAPER? BOARD? FILM? FOIL? FABRIC?

Clark-Aiken Stub Arbors cut costs with fast, easy, one-man roll changeovers. One arbor fits all roll widths.

Clark-Aiken Roll Stands are designed to meet all requirements for swift, efficient cutter feeding from roll stock.

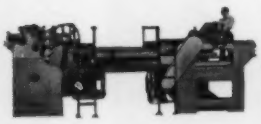
Type G Cutter for accurate, low cost registration and general purpose sheeting. Available in two models as is the Type D with Overhanging Piler (not illustrated).

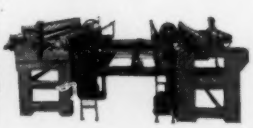
from roll...

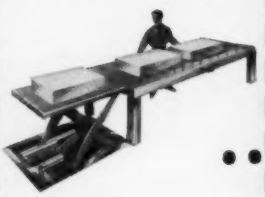












...to package...

Clark-Aiken C Cutter and Conventional Piler. Precision, high speed single and multiple sheeting. Can be used with Overhanging piler for easy side and end pile removal.

Type H Cutter with Conventional Piler in either Simplex or Duplex Models. Heavy duty cutting of board and pulp or multiple sheeting with extreme accuracy.

Clark-Aiken Automated Materials Handling Equipment speeds stock transfer between operations. Includes Lift Table (portable or floor mounted), Air Tables and Complete Conveyor Systems.

THERE'S A

Clark-Aiken cutter-piler

to help you do it

BETTER - FASTER

The superior design and rugged construction of Clark-Aiken Cutter-Pilers is recognized all over the world because they enable converters everywhere to take full advantage of the ultra high speeds achieved in the modern paper plant. Clark-Aiken Cutters make the difference in profits with important cost savings in labor and in low maintenance, 'round-the-clock operation.

Clark-Aiken equipment is your best bet for continuous, high speed efficiency with unerring accuracy because it is custom tailored to your precise sheeting requirements. So whatever your cutting problem, consult Clark-Aiken engineers for qualified answers based on your individual need and shop conditions.

In Canada: Gordon W. Keates, 133 Flora Drive, Scarborough, Ontario

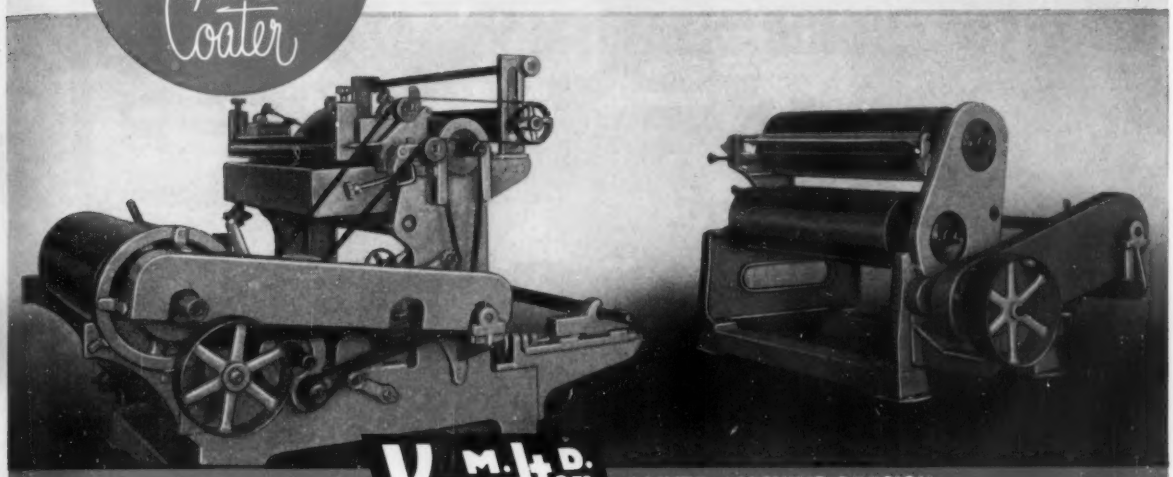
THE Clark-Aiken COMPANY

56 PAUL STREET

LEE, MASSACHUSETTS

Mayer 40-J Coater

The Mayer 40-J Coaters are designed for production roll coating, treating, and impregnating of fabrics and all weights of paper from 10# tissue to .020" board. They successfully apply single or double side web coating by paraffining, waxing, pyroxilining, lacquering, oiling, gumming, waterproofing, greaseproofing, asphalting, and similar hot or cold melt applications.



M. D. Knowlton Company

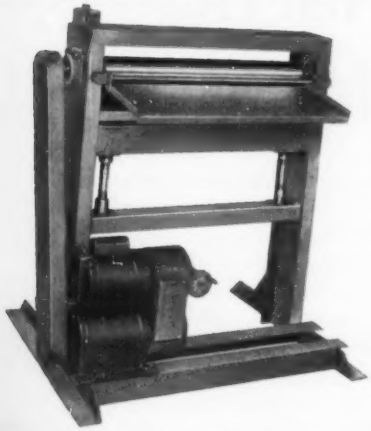
MAYER MACHINE DIVISION

28 INDUSTRIAL STREET • ROCHESTER 14, NEW YORK
45-53 BEAVER STREET • BROOKLYN 6, NEW YORK

CANADA
R.S. GOLD COMPANY, LIMITED • 888 DUPONT STREET, TORONTO 4, ONTARIO

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Production Perforator



Designed for high-speed perforating of:

Kraft board
Coated cardboard
Corrugated cardboard
Paper
Film
Many other products

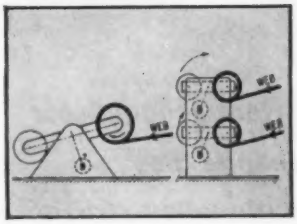
IDEAL FOR SKIN PACKAGING OPERATIONS. Easy to operate. Standard machines available in roll widths of 33", 48" and 60". Needle points on perforating roll come on standard square patterns of 1/8", 3/16" and 1/4" centers.

Our Main Perforator, with needle points, produces boards with minute, round, almost invisible holes that allow maximum air passage with minimum vacuum . . . make for better appearance, too! Easy-to-replace points in roll are alloy steel and will last for "millions" of holes.

Our years of experience in needle roll and machinery production are behind the manufacture of our Main Perforator. *For complete information, send today for brochure #202.*

ROBERT A. MAIN & SONS, INC.
Main & Park Streets, Wyckoff, New Jersey

HOBBS CENTER-SHAFT Web Winding Machines



8 Basic Designs, which can be modified to suit your requirements

Diagram showing layout of two-shaft and four-shaft turret winders

Hobbs center-shaft winding is superior to surface-drive winding, because it makes it possible to wind and to control tension without friction on the surface of the material. Thus abrasion or distortion is avoided and a roll of maximum usability or salability is assured.

The Hobbs Line includes a Single Shaft Winder, a Staggered 2-Shaft Winder, a Staggered 3-Shaft Winder, a Staggered 4-Shaft Winder, a 2-Shaft Turret Winder, a Light-Duty Turret Winder, a Medium-Duty & Heavy-Duty Turret Winder and a 4-Shaft Duplex Turret Winder. Width capacities range from 40" to 72" and load capacities from 150 lbs. per shaft to 2000 lbs. per shaft. 9 different types of drives are also available.

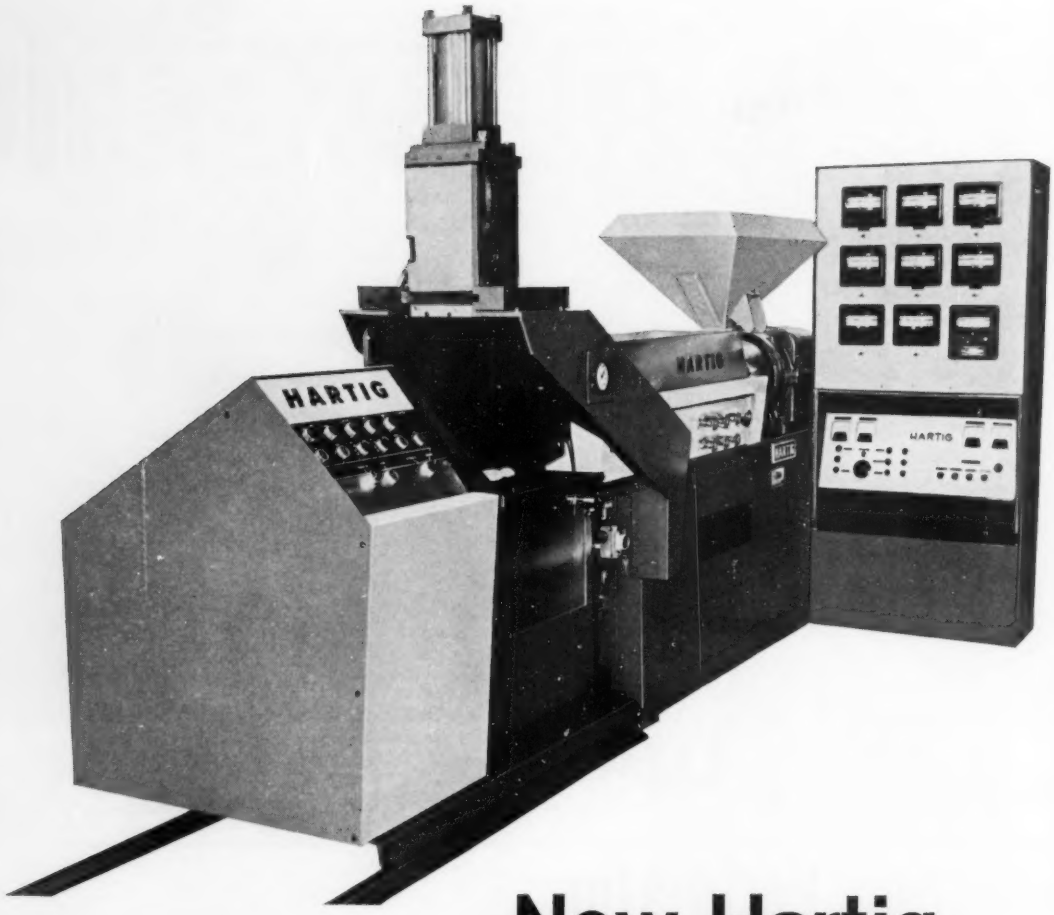
The various machines and types of drive are described and illustrated in "Principles and Practices of Modern Winding." Send for your copy, free of obligations.

HOBBS MANUFACTURING COMPANY
28 Salisbury St., Worcester 5, Mass.

Direct sales offices in Irvington, N. J., Columbus, Ohio
Chicago, Ill. and Los Angeles, California
Representatives in Cleveland, Ohio,
and Toronto, Ont., Canada

WINDERS • HAND & POWER SHEARS • SLITTERS • AUTOMATIC CUTTERS • DIE PRESSES

449-D



New Hartig Blow Molder

Ram accumulator

Quick change dies

Continuous extrusion

Accurate shot weight

Uniform parison

Water-cooled ram

For high speed, continuous molding of plastic containers up to 10" in diameter, this Hartig blow molding press features track-mounting for easy mold changes, minimum idle mold time, hardened and honed injection cylinder.

Waldron-Hartig also provides single-source competence in the production of complete coating-laminating systems, pre-plasticizers, pelletizers, and a full line of extruders. Write for specification sheet BM8.

WALDRON-HARTIG

technical competence in plastics process machinery

WALDRON-HARTIG, Box 531, Westfield, N. J./a division of Midland-Ross Corporation MR

In Canada: A. R. Williams Machinery Co., Ltd., 69 Montcalm Ave., Toronto, Ontario, Canada

Advertisers' Index by Subject Matter

DESIGN, PRINTING, GIFT PACKAGING

Listings do not necessarily cover entire line of advertisers or all producers in each category. See also the listing in the Buyers' Directory under the category for which information is sought, especially listings marked with bullets. Also consult Advertisers' Index in the last pages of the Encyclopedia.

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Jackmeyer Corp., The 641

MODERN PACKAGING ENCYCLOPEDIA '62

SECTION 15

DESIGN, PRINTING, GIFT PACKAGING

Packaging design*

Packaging design's importance has grown in direct ratio to the spread of marketing's most exceptional child, the self-service concept. The removal of personal selling, of personal persuasion, has left the consumer in a retail world where the primary guideposts to product selection are visual.

Even the customer who is led to a given product through exposure to advertising is lost unless that product's package can stand out and be found among its competitors. And those many customers who are not pre-sold by advertising wander through a colorful, but somewhat disorganized, product jungle. How many of a particular item are chosen depends largely on design's ability to convey visually the wanted information about the product it is to sell.

Actually, package design is an omnibus term, covering a variety of skills and including contributions from many fields. Into the melting pot of design is poured a score of unrelated factors and decisions: size, shape, name, materials, colors, symbology, emotional appeal, pictorial quality, motivations, re-use factors. All must be stirred up and sifted through argument, discussion, opinion and, inevitably, compromise. But the end product of this "mix"—the package—must be a single unit, grasped by the consumer as a perceptual whole, and remembered as a distinct entity.

Of course, design must be many things to many people. It must be informative in its first phase as it passes from its point of origin down shipping lanes into the warehouse and to the retailer. Emphasis here is not on the individual package, but rather on its shipping carton which must bear the proper coding, weights, etc., yet also incorporate graphics that make identity as well as handling easy for personnel.

From a store's stockroom to the shelf, design's emphasis continues to remain with the shipping and/or dealer containers. Instructions to open must be adequate if product damage is a problem, since so many stores, of necessity, rely on untrained help in re-stocking shelves. A thorough knowledge of in-store handling methods concerning the individual product enables the designer to work *with* rather than *against* the retailer.

Once the shipping container is opened, packages begin to function—individually and collectively. Individual function is made efficient by incorporation of a proper price-marking area, built-in stability no matter how stacked, container strength as conditions warrant, anti-infestation protection, and even in some cases proper devices to thwart pilferage (different-sized caps for different-sized bottles to prevent cap switching, small objects on outsized cards, overwraps on simple cartons where products might be switched, etc.). The retail package should be able to function properly whether it is stacked face up, end up or side out. It must have a strong center point so that the stockman knows immediately when a face-out point is reached.

From the moment the package hits the shelf it either communicates with the shopper or becomes camouflaged among its competitors. An effective package must have a believable design for not only the shopper but also the user. Even though women perform most of the shopping chores, design cannot be planned for an exclusively feminine market. If the product is being used by males, it must have a strong masculine quality so the female shopper can believe it would be acceptable to the user. Complexities occur whenever the buyer is not the user, and misinterpreting the "sex" of a package can hamper sales.

Aside from the many *selling* qualities that must be at work continuously in the store, the package and its design and the product must follow through on implied promises once the product is in the home. Quality implied by the design must actually be there. A promise of easy opening had better be backed up by fact or the next sale might never come. The container should outlast the product and protect contents to whatever degree is necessary. And design should also help the product to continue to identify itself no matter where it is stored, acting as a reminder to "use me."

A final but extremely important area where design must function effectively is advertising. No matter what media are used—newspapers, consumer publications, car cards, billboards, point-of-purchase or TV—the package and its design should project a simple but forceful and believable image.

This is especially true of television where the package shown on the screen must be remembered after all talk and histrionics are finished. Interestingly, several years ago when TV first made itself felt as a power in media, a marked trend developed in that packages were designed especially for the screen. Recently, however, it has become evident that if a package is sufficiently well-designed

*Prepared by members of the Package Designers Council, New York City, under the supervision of Public Relations Chairman, Karl Fink, and Mrs. Glory Harris, Executive Secretary.

to merit success on the store shelf it usually proves to be a "winner" on the TV screen.

In short, it is the package on the shelf that does most to stimulate final purchase. The package, as the ultimate salesman, must perform the final function of all the efforts to pre-sell the consumer. The importance of package design and the responsibility of the package designer come into keener focus when one realizes that the package receives greater exposure than any other means used to promote or advertise the product.

Factors to consider

Each packaging-design project is its own tight little island; its problems cannot be standardized. When any problem is approached in its initial stages, however, there are a number of common areas to be clarified for the designer.

1. He must know what type of message must be conveyed—what must be said to reflect the proper image and connote quality, quantity and the like.

2. His pre-design investigation will take him to the various areas in which the package makes an appearance. Some products end up in conventional retail outlets while others are distributed to the user in various other ways.

3. He must know what the environment of the package at its purchasing point will be—whether it will be sold from a shelf, bin, counter top, or similar device.

4. He will make an intensive study of competitive brands to avoid unintentional duplication in graphics or color—noting products which may not compete as such but do so visually simply because they are stacked next to the category under study.

5. He must think of shape and size, seeking the most suitable combinations for display, storage, etc., yet also bear in mind the consumer's natural preference for a "large-looking" or "good-value" package.

6. He must know what the client's attitudes are in regard to his line in order to discover whether a close family identity is necessary or whether each brand is strong enough through previous customer identification to emphasize its own name.

7. The designer must consider the importance of a modernized or new trademark for the client. (A trade symbol or character may be equally important.) A good trademark should say, in a flash, who a company is and say it so effectively that it is readily recognized wherever it is seen and, in fact, come back to mind whenever the name of the company is heard. Furthermore, a good trademark can be used effectively on a carton or a water tower, a small bottle or a large billboard, a desk or a derrick. It can be used in all printed matter, stationery, promotions and advertising, and this means it must reproduce well in any size or color, in black and white, on TV screens, etc.

8. Another area for close study concerns the various reproduction techniques available. A thorough consideration of their possibilities and limitations must be undertaken. In creating the proper illustration for the design, it may well be that the designer will avoid some of the usual art forms in the product category which have almost become graphic clichés. Some items lend themselves to a picture of the product itself; others had best be shown imaginatively; some require no illustration.

Working drawings and finished art of the various types necessary for reproduction on present-day packages must be properly prepared. The client, the designer and the packaging materials supplier or converter must set up efficient working liaison so that all production information is shared early enough in the project to enable the designer to use it properly in the conception and, later, in the production specifications. The responsible professional design consultant usually insists on preparing all production drawings and considers it his duty to see all proofs, test runs, ink samples, etc., to assure the best possible job.

9. In the use of typography, the designer must refer to his acquired information about who the buyer is and who the user will be. When the two are one and the same, the approach will be different than it is in a situation where the two are separate. After all, typography can be feminine, masculine or a combination of both. Additionally, typography can emphasize gaiety, humor, fun, etc., or even seem childlike where the product is to be consumed by youngsters. In any event, printing limitations will influence the choice.

10. Readability is another problem facing the designer. The text on a package must be understandable and informative. Also, the customer has to be able to see and read the text, no matter what the package surface may be. And if there is a special situation, such as a sale, gift premium, etc., the package copy should relay this timely information boldly and quickly.

11. When color is considered, certain colors often will be ruled out because of over-use in the product category. Often the store area in which the product is stocked will have a bearing on color selection; for example, a product normally appearing in a dark area would be effectively camouflaged if a dark color were used. Furthermore, attempts to reflect happiness, dignity, fun and the like can also dictate the ultimate choice of color. Then too, color coupled with design can be highly effective in a multi-unit display by producing attention-getting patterns.

12. The method of assembly for the package is of concern to the designer. Hand labor, if involved, can be expensive. Machine assembly may require the adoption of existing machinery or the acquisition of new units. Many manufacturing aspects and details are present and can have an important influence on the design.

13. Much the same can be said for the materials used in a package. The designer must weigh the cost, functions, qualities, pros and cons of a continuously growing and changing list of materials, which may or may not be practical to use in his design.

14. Package testing covers a broad, familiar area for the designer. Tests can include handling, shipping, bursting and other physical manifestations; or they can involve psychological and market testing. Often this is coordinated with certain pre-designed research projects.

Handling of design

Package design in progressive companies is handled through various channels: independent design services, supplier design services and internal design services. The manner in which a manufacturer selects a designer depends largely on the nature of the project.

Generally, the addition of a new flavor or a combination of two existing products can be handled adequately by the manufacturer's own design staff. However, many manufacturers choose to use independent design consultants because of the fresh thinking and objectivity they might bring.

Some manufacturers have design liaison directors who act as knowl-

edgeable intercommunication men between the product manager and the various outside design offices. Other firms with design staffs of their own, and headed by competent designers, still call in outside professional designers for important projects. Then there is a tendency among some of the larger producers of packaged goods to use numerous design offices for their various products. In contrast, some of the smaller companies handle the procurement of packaging design through the advertising department with top executive guidance and authorization. Interestingly, the purchasing department's involvement with packaging design on a creative level is fast disappearing. A new kind of cooperation and teamwork is emerging between purchasing and the outside design consultant. Generally speaking, these services are coordinated by a director or supervisor or coordinator of packaging.

Many suppliers, of course, provide design services in connection with the products that they manufacture.

An effective method of obtaining package design and merchandising guidance is to let the independent designer operate as a packaging supervisor. From lists supplied by the Package Designers Council (or, see the Directory, p. 727), the manufacturer can pick a number of professionals to meet with responsible company officials and discuss the project. Full particulars and all pertinent data then should be given to the designers. Based on these meetings and the material mentioned, designers will prepare written proposals, outlining objectives, approach, a plan of action, timetable, costs and the like.

Obviously no two proposals will be similar, for no two designers work the same way or have the same approach to a problem. Therefore, the job of the manufacturer is to determine the soundness of each proposal based on the company's intimate knowledge of the industry and its own objectives for the future. Furthermore, a thorough study of each designer's background should be made, including both the man and his organization, his past packaging experience and his professional reputation. Through his written proposal a good idea of his working methods and approach to a problem will have been ascertained.

The purpose of this method—of using outside design help—is to benefit from the designer's, or design office's, broad experience and to obtain successful ideas from other fields. Specific industry experience can be helpful to the designer, but often the designer is in a position to bring fresh thinking to an industry where he has not been active recently.

Visual promotion is a vital element to be considered at every step of the package-planning program. The advertising agency and the directing designer should work closely together to achieve a design that will work well in all media, either in black and white or in color, whether reduced or blown up. The designer should have contact with the consumer, retailer or people who handle the package in the plant.

Packaging research involves a study of the package, both physically and psychologically, wherever it goes and is handled, with the objective of effecting improvements in design. A study will be made in the plant to check on efficiency in stacking and filling, in warehousing and sealing, on size and types of outer cartons. A study will be made at the retail counter to note ease of display, of stacking; how to reduce spoilage and to improve identification; and to determine whether labeling is complete and easy to read. A check at the consumer level will point out whether or not the product is easy to open, easy to use; whether identification and instructions are clear to the customer; whether the package is pilferproof.

Designers today have extended their knowledge into the field of packaging production. They are familiar with packaging materials, machinery and methods. This means that the professional independent designer often can recommend valuable revisions to cut costs and increase efficiency.

When it comes to pricing of design work, management should have a clear understanding of costs before embarking on a project. The services of a package design consultant to his client will vary considerably with the account, with the projects involved and with the personnel concerned. The make-up and procedures of design offices vary considerably, but even within one office one usually finds variance in contractual arrangements, types of service and methods of payment with the various clients. It is strictly a custom service and cannot be pigeonholed into standardized methods.

Most offices base their charges on the time expended on a client's behalf. There are retainer contracts that may be entered into. These may cover the basic design fee for the head of the design firm with the understanding that any staff effort be billed at mutually acceptable rates. There also are retainer-guarantee arrangements where the client promises to use a certain minimum amount of a design office's effort, thereby making it possible for the office to apportion adequate personnel for that account.

Designers will submit a very business-like proposal, covering all important points in the carrying out of an anticipated program. The matter of estimating costs on a design and development program is difficult. Some designers and their clients find that, after the first project or two, mutual confidence makes it unnecessary to try to estimate costs on creative effort which may vary considerably before the desired results are obtained. Professional designers do not work speculatively. Occasionally there are royalty arrangements over and above adequate compensation to cover immediate design costs.

The future

It is reasonable to assume that there is a rich future ahead for packaging design.

The materials field is teeming with new developments. In addition there are changes in manufacturers' processing methods—dry freeze, for instance. And improvements in refrigeration at retail also will bring about notable changes. Cases allowing face-out stacking of products are on the way. Ultimately, the upright refrigerated three- or four-shelf case will be common, and frozen-food products will be transferred to packages affording more stability when stacked upright. In the dairy field, the staggered three-shelf case is replacing the one-well case, and modern stores use a fixture that contains flush shelves and an air curtain, instead of doors, to retain the proper temperature.

Along with the trend toward packaging for multiple-unit-sales—the twin-pack, the six-pack, etc.—is packaging with built-in convenience features to benefit the consumer. Then, too, there will be the development of more of the type package which serves as a product in itself, especially in the premium field. Special attention will be given to the "take-home" package that has social acceptability in the dining room as well as in the kitchen.



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TODAY'S effective package printing is the result of ever-improving techniques in the graphic arts. (*Milprint photo*)

Printing arts for packagers

by C. K. Billeb*

Package printing is sales communication. It is *package relations* created by means of typography, color, illustration, and other design elements. It is labeling and identification of packaged goods. It is salesmanship, showmanship and the expression of packaged goods personality. Package printing is the means of effecting an emotional and practical response by shoppers. It is a medium for reflecting the moods, needs and search for progress that each shopper brings into the store. It is the indispensable link between packaged merchandise and all the buying influences the merchandiser has managed to create with advertising, promotion and accumulated product reputation and acceptance. It is an expression of both product and corporate images.

Viewed in proper perspective, package surface is probably the most valuable space available to the marketer of packaged goods. As a medium of circulation it cannot be excelled. Moreover, package surface and its circulation to a buying audience belong to the packager without added cost.

Advances in package printing occur on a wide front and continuously. The use of the printing arts is the one area that the large and diverse packaging field finds universal. The most successful packagers count on advances in the printing arts to give them continuing improvements in package appearance and in fresh, more effective merchandising approaches. They look to progress in printing inks, equipment and techniques for a permit to use new materials, new surfaces and new package forms. Finally, packagers look to skilled use of the printing arts for a vital and critical area where many thousands of dollars can be saved. Examples of this have been experienced by virtually every packager.

Trends and developments

Advances in the printing arts have much to offer packagers, and the next ten years may be more productive than were the past 20 years in providing more efficient operations and improved printing results.

The areas that will be especially challenging include:

- The gains to be made in screen reproduction, based on advances in color photography and in printing techniques. Greater faithfulness in reproduction always has been a challenge because realistic reproduction can be such a vital sales stimulant. Today's selling trends call for more and more effort to put the third dimension into reproduction, for, basically, an optical illusion usually created by package printing is the start of any action affecting the package in a retail store. Since the excellence of printing reproduction affects the quality and the effectiveness of the optical illusion, practically every merchandising force continually demands better reproduction. Moreover, there is a trend toward showing the product in functional or "atmospheric" context. This trend is currently demonstrated by the concepts so dramatically highlighted in the advertising appearing in one of the wom-

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en's magazines. The freshness and the charm of these beautiful product-in-use illustrations are almost certain to have an influence on package illustration and, in turn, on reproduction techniques.

• Another area for progress will stem from the research and engineering advances developing within the printing industry itself—advances spurred not only by the packager's demand for greater realism but also by the printer's need for greater efficiency and economy. The advances in this field are being pursued by printers in three major areas: mechanical, chemical and electronic. The net result is to reduce the area for human error. More and more technical skills are being built into the presses. Problems of register, adhesion, drying, printing uniformity and quality control are yielding to new technology.

For example, in the production of printed cartons there is a trend to lithographic reproduction to obtain improved tone work. The future suggests roll-fed lithographic process to obtain lower handling costs, finer screen detail and softer impression to give a smoother effect. A problem still to be solved is improvement in the drying character of inks for this process. For certain large runs, there is also a trend to gravure-printed cartons. Again, the effect desired is smoothness and fine detail. Also, there are economic advantages.

• Another trend is the replacement of rotogravure by flexography where simple tone work is all that is required. Development of improved inking systems has provided a more even distribution of ink and permits improvement in tone quality.

Improved mechanization of the screen process has increased use of this method for package printing, notably with the use of opaque and fluorescent inks. Faster press speeds are bringing about significant changes in this field. Delivery time is speeded so significantly that packagers have found screen printing much more practical, especially for use in the many promotional or seasonal types of package printing where screen process is desirable yet often planning is late and production hectic.

A significant new development in package printing involves the process known as heat-transfer. (See p. 625.)

A third area for progress involves improvements in inks. (See p. 626.) Significant advances in package printing can be expected as the result of continuing research to develop inks that are faster drying, more heat resistant, more oil resistant and those that are specifically engineered for use on the newer materials being introduced for packaging applications. In the yet-to-be-realized stages are interesting potentials for thermoplastic, magnetic and other extra-functional types of inks.

• A fourth source of progress in package printing will stem from the increasing variety of new and improved packaging materials. The plastics, paced by the polyolefins, will be among the foremost contributors to the advance. Also, there will be increasing opportunities through the medium of combination materials, especially those employing newer types of coatings and sizings.

In general, the progress that can be anticipated in package printing will be extensive indeed. Obviously, however, individual rewards will be greatest only for packagers who put advantages together in specific combinations. This necessitates continuing study and the exercise of great skill on the part of packagers and package printers.

Industry profile

Historically the printing arts developed as a method for printing on paper. Two major categories resulted. One was for printing fine papers. Letterpress and lithography were developed as the processes best suited. The second division involved the printing of coarse papers, and gravure and flexography proved most satisfactory. In the packaging field, there was an evolution of printing to handle paper-foil combinations, cellophane and plastics. Many of the initial distinctions of the processes for fine and coarse printing were lost as a result. Subsequently there has been much crossing over from one process to another, with the variables increasing all the time and all processes being improved to handle a greater range of jobs and handle them better.

Package printing tends to specialization according to the type of package. Printing establishments generally concentrate their efforts in one of the following categories—the printing of (1) flexible packaging materials—wraps and bags, (2) labels, (3) folding cartons, (4) corrugated cartons, (5) rigid containers such as cans and glass or plastic containers, and (6) a miscellaneous classification to include various types of specialty printing and decoration. For obvious reasons of efficiency and economy, package printing is usually done by the package fabricator, but some types of graphic arts are sometimes done by a custom specialist. Embossing, coating and custom finishing are examples. There is still another classification of package printing and it's a large one: namely, in-plant marking and coding. (See article on p. 546.)

Establishments for package printing range in size from those serving the largest national accounts to those that are only a small "bedroom shop." There are some 450 major package printing establishments and an estimated 95% of their output is devoted exclusively to package printing, with the other 5% going into promotional printing. Because shipping costs of packaging materials are a large factor, printing establishments are set up to serve regional markets. Traditionally they offer considerable service—ideas, design, investigation of new methods and materials.

Some package printing is done by the packager in what is known as a captive operation. In general, the conditions which are required in order to make captive printing practical are very large volume and great uniformity in the type of printing, plus consistency in use of the item over a long period.

Major processes

It is difficult to view the vast field of printing arts in its entirety and perhaps even more difficult to see it in an exclusive packaging focus. However, a study of the chart which follows this article will be helpful in appraising the extent of the package printing field and some of the characteristics of the various processes.

As shown (pp. 618, 619, 621), letter-press and flexography are printed from raised surfaces; gravure is printed from a depressed or etched-cup surface; lithography, also known as offset, is printed with a blotting action from a flat, plane surface; screen process transfers an inked impression through a patterned screen or stencil; roll leaf stamps foil onto paper or plastic. Decalcomania and heat transfer are essentially methods of applying preprinted copy or designs to package surfaces.

In letterpress and flexography, the original plate is an engraving in zinc,

copper or magnesium. This plate is prepared to the point of etching by photographic processes with the final "print" on the plate being the etchant resist allowing the nonprinting areas to be removed from the plate by the etching acids. After the original plate is made, one for each color, duplicate plates can be made by various means to provide the multiple repeats of designs necessary for the economical production of the printed material. At this stage, basic letterpress and flexography part company, each proceeding in a different direction.

For letterpress, duplicate plates can be either of two categories: stereotypes or electrotypes. Stereotypes are metal plates cast in a special paper-like plastic mold and then nickel or chrome plated for endurance. These are made in single units only and grouped in multiples by mounting on a frame or on a press cylinder depending on whether the duplicates are flat or curved. Electrotypes are made from a wax mold impression of the original and are electrolytically coated with metal and then given a solid "body" by casting metal into the resulting metal shell. These can be made as single plates, flat or curved; or, by a "step-and-repeat" process of molding, they can be made as multiple units in a single metal plate. Electros are mounted in the same manner as stereos.

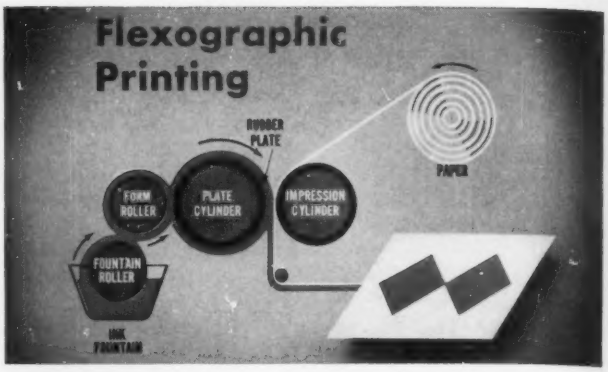
Letterpress offers a broad range of advantages: strong color solids, fairly easy color control, and clean-cut detail work. Plate changes and corrections can be made fairly easily.

There is heavy demand for realistic portrayals of products, either separately or shown in use. Letterpress excels in this respect. The oil-based inks used are somewhat slow drying, a condition being steadily improved. A desirable high gloss is readily attained with letterpress and the new quick-set inks. Metal plates also tend to wear down, as the runs increase. The choice of proper stock permits the use of finer tone screens, with all the richness of overlapping and overprinting screens and solids. The running of plates with very fine and light screens next to ink solids always requires extreme care, for a very heavy ink solid may cause filling in of the ink on the adjacent light screen.

For *flexography*, the original plate is duplicated, one unit at a time, in rubber. To accomplish this, a plastic mold is made of the original plate and a rubber duplicate plate is then formed in the plastic mold. The grouping of units on the press is done by mounting the required number of single units on the press cylinder using a double-surfaced adhesive sheet between plate and cylinder.

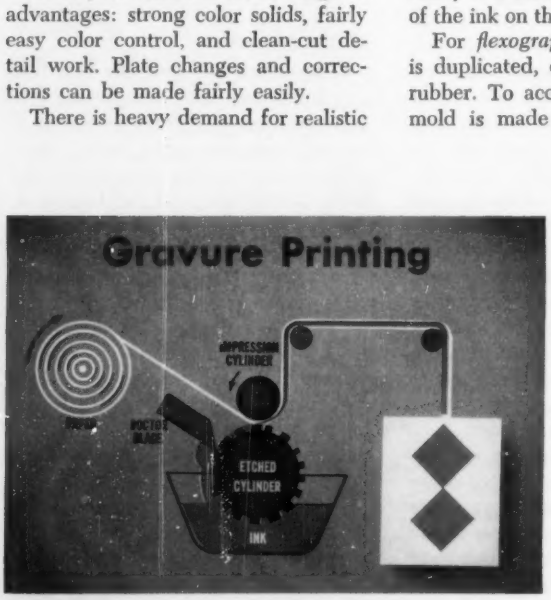
In both letterpress and flexography, the plates are inked by rollers passing over the raised surface of the plates. The ink is then transferred to the surface of the stock by direct contact of the plate to the material. Letterpress, using inflexible metal plates, will print a true image of the plate itself as long as the impression is sufficient to provide complete surface-to-surface contact of plate and paper without embossing or breaking through the material. Flexography, using relatively elastic plates, requires diligent impression control to make

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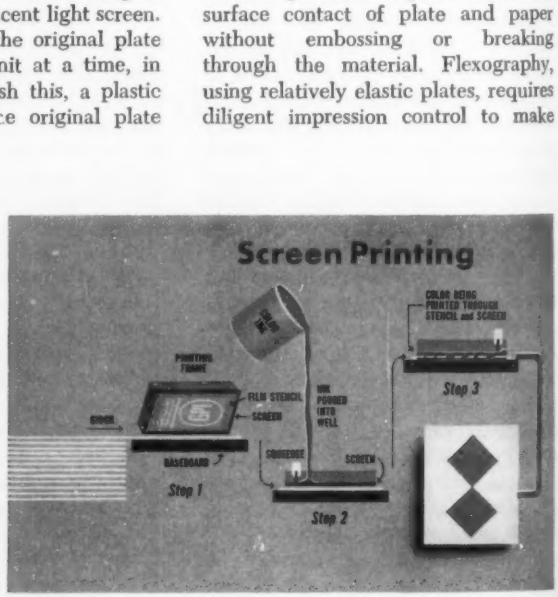


Raised surfaces on rubber plates; inks similar to gravure's. Outlines not as regular as letterpress. Excellent results with large areas of solids and vivid colors.



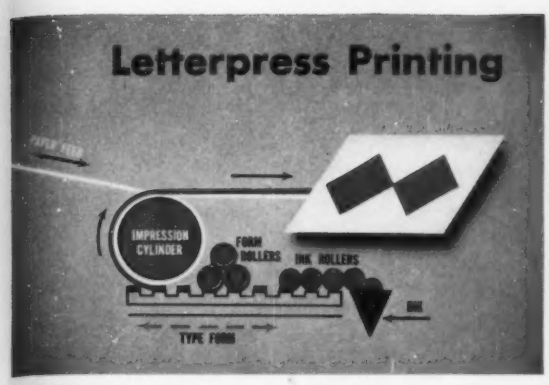


Cup-like cells carry ink to printing surface. Edges are irregular. Excellent on films and foils which, non-absorbent, require ink that dries by evaporation only.



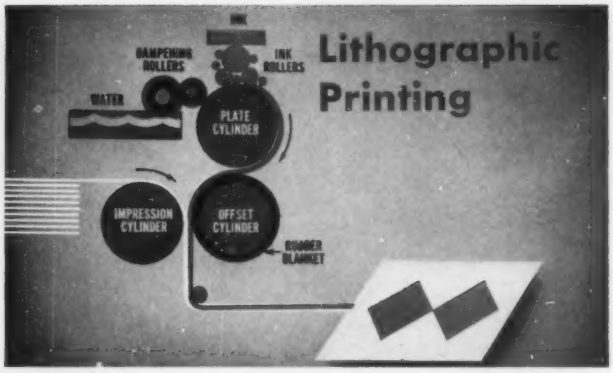


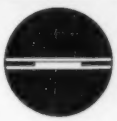
Stenciled pattern (Step 1) controls design. Ink is poured into screen (Step 2) for heavy lay-down of color; forced through stencil (Step 3) to surface. Excellent for odd shapes, hard-to-print surfaces.





Raised surfaces on rigid plates press ink into material. Clear, sharp impressions. Excellent for corrugated cartons; folding, set-up boxes; other converting operations.





Impressions on specially treated plate transferred to blanket then to surface of material. Excellent on most materials when soft, diffused effects are desired.

sure the image is printed without distortion caused by squeeze-out.

In *lithography*, the printing and nonprinting areas of the plate are on the same plane surface. The basis of the process is that water and grease (ink) do not mix; each repels the other. Therefore, the litho plate is photographically and chemically prepared so the nonprinting areas accept water and thereby repel ink while the printing areas accept ink and repel water. Since the original plate in lithography is also the press plate, multiple designs must be prepared by a step-and-repeat process.

In the press, the nonprinting areas of the plate pick up and hold water from a separate roller-fed wetting system and when the ink rollers come in contact with the plate the design areas alone accept the ink. The plate itself then prints the design on a rubber-covered cylinder or "blanket" that matches the size of the plate. This roller or "blanket" then transfers or offsets the design to the paper itself.

Presses for offset and letterpress are divided into two major categories: sheet-fed and web-fed. In packaging converting, both are used, each for specific purposes. Most carton work in these two processes is done on sheet-fed equipment.

Gravure preparatory work is very similar to litho, in that the multiple images must be photographically prepared prior to the transfer of the design to the cylinder. Here, again, the original cylinder is the press cylinder. In the processes previously described, the ink was applied to the surface of the plate and impressed or printed on the paper. With gravure, the ink is applied to fill the etched depressions in the cylinder and it must be *removed* from the outer surface by the scraping action of a doctor blade prior to actual printing contact.

In gravure, it is not possible to etch out large printing areas as continuous openings. The doctor blade that removes the ink from the nonprinting surface must have a constant surface on which to ride. Therefore, the printing areas are broken up into individual wells or cups, each being a small reservoir of ink picked up as the cylinder revolves in an ink bath. The ink is transferred to the paper surface as the impression is made. The areas that appear solid on a gravure-printed article result because the ink spreads on contact with the paper or film. The amount of spread is regulated by the area and depth of the cup in relation to the area of wall between cups. The methods of regulating ink transfer are many and varied.

The average packaging-material gravure press is limited to handling 36- to 40-in. webs, but there are specialized gravure presses for linoleum printing that will print a pattern 108 ins. wide, or wider.

Screen process printing was originally known as silk screen printing, but very few of the larger shops use silk as their screen medium. The process basically is one of forcing ink through a stenciled screen. Most commercial printers now use stainless steel screen with mesh ratings much finer than possible with silk. Preparatory work, as with the other processes mentioned, is largely photographic in the making of the screen or stencil.

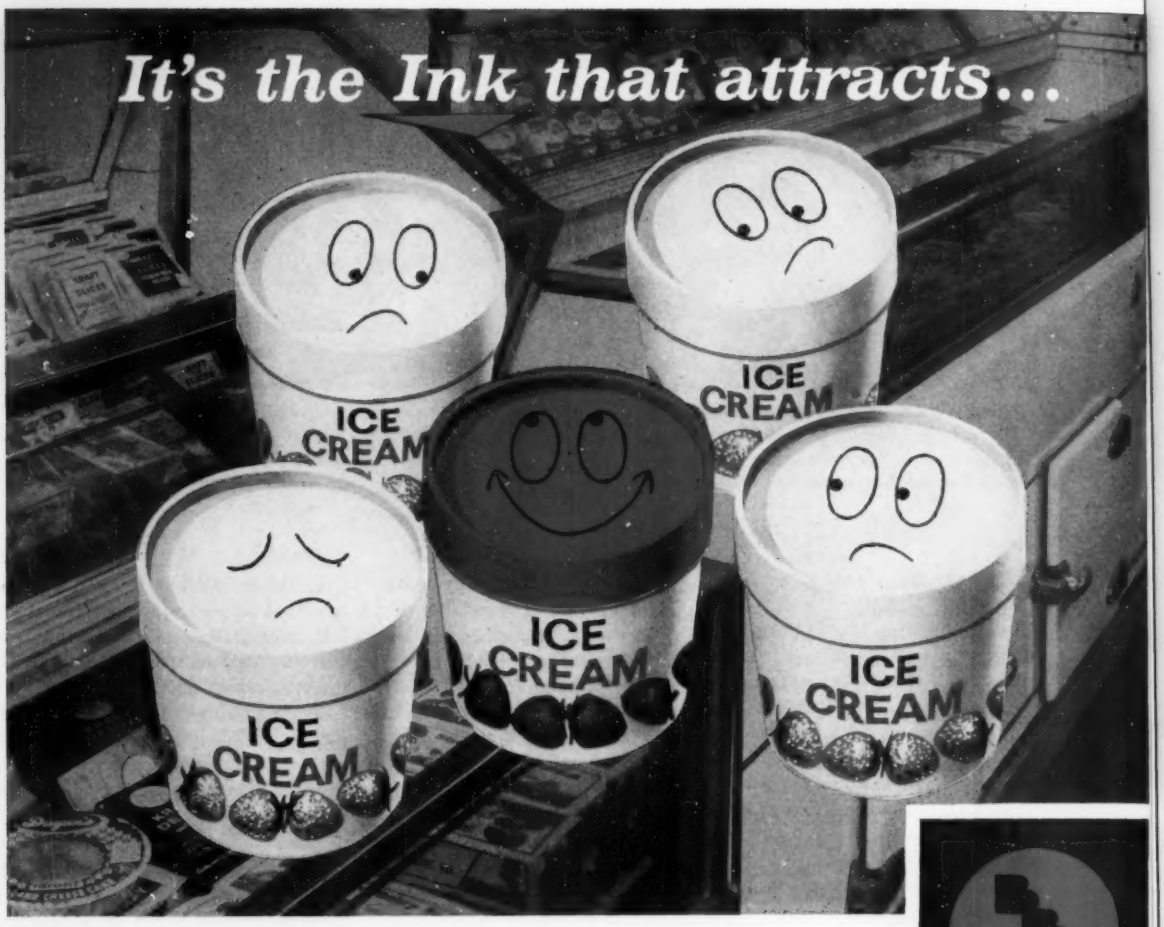
Presses for screen printing range from the simple box frame and hand-operated squeegee, which forces the ink through the stencil, to the completely automatic machine that prints, dries and racks finished work.

Through the use of specially built jigs and printing frames, screen process can be readily adapted to the printing of rounded and irregular surfaces of bottles, tubes and any variety of plastic and metal objects. (See also pages 285 and 363.)

Standards and tests

The importance of uniform quality can scarcely be overemphasized, and this in turn is closely related to the problem of proper specifications. The subject is complex, but the fundamentals of a sound approach are simplicity itself. Don't tell the printer what to do or what to use. *Tell him what you need.* A checklist of requirements to be considered is on p. 623. The chief objective in using such a list is to anticipate and eliminate in advance the serious and costly errors that can occur when an important requirement has not been taken into account. The most successful users of package printing define their requirements and write their specifications to cover their needs. They then use a statistical quality control approach as the ultimate elaboration of printing specifications to measure printing quality and consistency from run to run.

Considerable work has been done in developing specialized tests for printing quality and performance. Several associations and commercial organizations contribute to this field; a major source is the printing committee of the Packaging Institute.



and the ink you'll see is...

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	CELLOPHANE: Plain Transparent	CELLOPHANE: Moisture Proof & Anchor Coated	CELLOPHANE: Polyethylene	Foil	Paper and Board	Glassine	Polymer Coated Cellophane	Pliofilm	Saran*	Vinyl	Polystyrene	Acetate	Mylar** & other Polyester Films
EXCELLOPAKE	•	•	•	•	•	•							
TRANSLUSTRO (dye)					•	•							
FLEXOCRAFT (pig. & dye)					•	•							
HYDROTONE					•								
VELVATEX					•								
FOILBRITE (dye)				•									
PLIOPAKE								•	•	•	•		
ACETOPAKE												•	
THERMOFAST		•											
MUL-T-BRITE	•	•	•	•	•	•	•						•
FLEXOGLOSS	•	•	•	•	•	•	•						•

* Dow Chemical Trademark ** Dupont Trademark

Depending on end-use and grade of stock

GPI Sun

GENERAL PRINTING INK
DIVISION
Sun Chemical Corporation

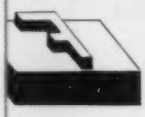
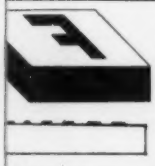
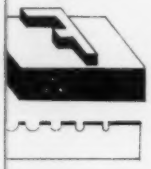
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PRINTING METHODS FOR PACKAGERS

Printing process	*Typical packaging uses*	*Types of artwork handled*	*Artwork processing*	*Printed*
Letterpress	All types of labels, merchandising tags, bag headers; corrugated and folding boxes; kraft bags; waxed bread wrappers; bleached kraft liner; all types of bags for dry products; cotton burlap bags.	Full range—type to tones.	Negative of artwork is reproduced on sensitized metal plate (photoengraving). Blank areas are etched away by acid leaving printing surfaces in relief. Screen from 65 to 133 is common.	 Raised su
Gravure	Cigarette wraps, cups, flip-top boxes and cartons; labels; folding boxes; bottle carriers; wraps and bags; laminations; bread wrappers; candy wraps.	Order of preference: Transparencies; Photos; Carbros; Flexichromes; Water Colors; Oil Paintings; Pastels. Best to use sans-serif type, 8 pt. or larger.	Cylinder or plate is etched through photosensitive gelatin film (carbon tissue). Printing is intaglio (i.e., from thousands of tiny depressed cells, usually the depth of cell governs the tone—the deeper the tone, the deeper the cell. However, in newer processes, cells vary both in depth and diameter, providing easier tonal control). Screen normally 150; 85 to 300 for solids.	 Depressed
Offset Lithography	All types and styles of cartons—dry and waxed; labels; bag toppers; rigid plastics; metal bottle caps and metal beverage, oil, food, candy and tobacco containers.	Any kind—oil; water color; transparency; dye transfer.	Photocopy reproduced on sensitized metal plate to produce surface areas that will accept ink. Other areas of plate surface accept water; reject ink. Screen to 300 used, but usual range is from 133-150	 Plane su
Flexography	Bags; labels; wraps; corrugated carton stock; egg and milk cartons.	B&w drawings or photography; color art. Best suited to large areas of color and line art. Can use coarse Benday and some gray tones.	Zinc is etched and a negative matrix made by impression; rubber is then vulcanized under heat and pressure on the matrix. Screen should be no finer than 85-line. Generally use 85-line on paper, cellophane and polyethylene and 65-line on board.	 Raised su
Screen Process	Permanent marking of glass containers. Sampling and comprehensive presentations of designs for all types of labels and flexible packaging materials; box wraps; folding cartons; sleeves; display boxes; labels; gift wraps.	Full-color art; dye transfers, Ektachrome for four-color process, screen normally not over 65-line; primarily line art, b&w separated. Halftones, Benday—single color.	Positive of line or halftone art is exposed with photo stencil film. Clear areas harden, positive areas remain soft and wash out in chemical bath. Hand cut stencils are prepared by laying stencil film over art and cutting out the printing areas for each color.	 Rubber bl squeegee fo through ope
Roll Leaf	All types and styles of cartons; labels; paper, plastic, polyethylene bags.			Foil applied and pressu taneous im no drying re
Decalcomania	Milk bottles; cosmetic and pharmaceutical bottles; displays; marking chinaware.			Preprinted d leased from material.
Hot-transfer	Decoration of plastic bottles, lids, etc.; also films, foil, paper, folding boxes. Direct printing effect for promotion or product information—added to or used instead of preprinting.	Full range—type to tones.		 Heat applied (A), releases (B), transfer onto surface

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Printed by	*Plate or other printing medium—material, endurance*	*Inks—characteristics*	*Color flexibility*	*Color procedure*	*Material that can be printed by this process*
 aised surface.	Nickel or chrome on steel; copper; zinc; type; plastic; rubber. Endurance range is from 100,000 impressions or less, depending on material, to millions of impressions with nickel or chrome on steel.	Oil-base inks used for sheet-fed corrugated and folding boxes have superior gloss and rub resistance. Steam or moisture-set inks—web-fed—for kraft bags, waxed bread wrappers, folding boxes, bleached liners; fast almost instantaneous drying; hard to get real gloss. Heat-set inks have good gloss; are used for web printing.	Oil-base inks—infinite color range. Steam or moisture-set inks—adequate color range but not so extensive as oil-base.	Immediate in-line color printing possible. Many presses, however, require a separate pass or use a split fountain.	Paper, board, glassine, cellophane, acetate, some other plastic materials, foil under some conditions.
 pressed surface.	Chrome-coated copper can print 5 million revolutions without rechroming; can print 12 to 20 million revolutions before making new cylinder, according to material printed.	Hydro-carbon, alcohol, lacquer bases —good gloss and good rub resistance; very fluid, fast drying; all dry by evaporation of very fast solvent; varnish lacquers and gold printing common in packaging.	Unlimited—with four colors can match any color.	Immediate in-line color printing over dry ink each time.	Paper, board, textiles, waxed paper, glassine; plastics including acetate, Pliofilm, polyester, saran, polyethylene; cellophane; foil; light gauge aluminum, other metals.
 Plane surface.	Zinc—100,000; Copperized aluminum—from 200,000 to 400,000 depending on material running; stainless steel—million; Lithure (bimetal plate made of several hard metals)—possibly up to 5 million.	Recent improvements have produced faster drying inks and inks with more gloss and better scuff resistance. Inks are heavy-bodied pigments; must be insoluble in water. Stronger with higher pigment content than letterpress inks because litho lays thinner film of ink.	Can match most any shade.	Immediate in-line color printing achieved.	All papers not attacked by water; board; sheet metals; some rigid plastic sheets; foil; cloth.
 laised surface.	Natural rubber; synthetic rubber; compounds. Number of impressions varies with type of rubber, ink solvent system and fineness of type or design details. Half million to one million revolutions should be possible.	Solvent-base inks—used for cellophane, plastic and paper printing. Water-base inks—used for liner board, corrugated stock, kraft paper, tissue, waxed paper —have excellent press stability. Dyestuffs or pigments can be used; ink is low-cost, particularly with dyes. Very fast drying.	Can attain exceptional color brilliance on some surfaces because of heavy layer of ink; unlimited flexibility in color.	Immediate in-line color printing achieved.	Paper, board, foil; glassine; cellophane; plastics including acetate, nylon, polyethylene, saran, polyester, Pliofilm.
 ber blade or egee forces ink igh open design.	Photo stencils are sensitized films adhered to fine-mesh silk, metal or synthetic screen. Hand-cut stencils are lacquer films adhered to screen. Endurance is governed by detail and type of ink. A reasonable average might be 25,000 to 30,000 impressions.	Solvent, oil, rubber and water-base inks—can have excellent durability, lightfastness; drying speed depends on stock printed. Inks can be specially prepared for flow and drying characteristics. Dry by solvent release or by oxidation. Ceramic pastes are used for bottles and jars; special inks for plastics. Type of ink determines whether print will be flat or have a lift.	Color opacity unequalled. Full range of colors and gloss available. Range: opaque to transparent inks.	Usually requires separate pass for each color but can use split fountains.	Glass, paper, plastics, foil, textiles, (adaptable to all kinds of materials, all sizes and shapes).
applied by heat pressure—instanous impression—rying required.			Wide range of colors —including gold and silver.	Color depends on leaf or foil used in stamping; usually is a one-color process.	Cloth, wood fibre, paper, leather, soft and hard plastics, hard rubber, most other materials.
rinted design re-d from backing rial.			Depends on printing process used. Offset and silk screen are most commonly used processes.	Decal is preprinted and all colors are transferred at once.	Glass, leather, plastic, metal, china.
 applied to paper releases coating transfers printing surface(C).		Thermoplastic—can be specially formulated for product resistance and adhesion to a wide range of materials.	Full range of color and aesthetic effects possible, including transparent, opaque and metallic.	Transfer tape is preprinted and all colors are transferred simultaneously, and are immediately dried.	Most transparent packaging films, waxed papers, lacquered foils; most plastics, glass, lacquered metals boxboard, etc.

aterial that be printed this process	*Practical run*	*Press speeds (attainable, not average)*	*Especially recommended for*	*Special advantages*	*General limitations*
r, board, glass-, cellophane, ite, some other ic materials. under some litions.	Medium runs from type; longer runs from plates.	1,500 to 7,500 impressions per hour depending on type of press and material running	Crisp type; small type; dense black type; very fine linework; sharp, clear-cut details. Fine halftone work on smooth and coated paper.	In-line die-cutting, creasing, embossing are possible on most types of presses. Jobs needed in a hurry can be set quickly; corrections can be made up to the last minute.	Need uniform paperboard; high temperatures eliminate some thermoplastic materials; nonabsorbent materials require special techniques.
r, board, tex- waxed paper, ine; plastics in- d i n g acetate, ilm, polyester, a n, polyethyl- cellophane; light gauge inum, other ls.	Long runs and medium runs; usually over 50,000 or 100,000; some users recommend minimum runs of 1,000,000.	Web fed: For all kinds of paper—1,000 to 1,200 ft. per min. Paperboard — 600 to 1,000 ft. per min. For film and foil—250 to 600 ft. per min. Sheet-fed materials — 3,000 sheets per hour.	Quality and speed on long runs. Fine gradations and detail on plastic, cellophane and metal foil. Fine quality work on short runs for sheet-fed.	Ability to use fine-line screen on rough material permits use of less expensive paper and board to produce quality reproduction at a reduced printing cost; supplementary cutting, creasing and stripping can be handled in-line. No make-ready.	Gravure plates and cylinders take much longer to obtain. It is difficult to make changes or repairs on the press.
papers not at- ed by water; d; sheet met- some rigid plas- sheets; foil; n.	Any length run.	Web fed—up to 1,200 ft. per min. Sheet fed —2,000 to 7,500 per hour.	Fine tonal work on boxboard. Short runs with many illustrations. Vivid, brilliant color printing on sheet metal for can making.	Prints a fine screen even on rough, coarse surfaces. Simple corrections can be made on press. Low-cost and quick plate making. Commonly used process for printing tinplate. Quick make-ready.	Imprinting, die-cutting, creasing, embossing require special press structures.
r, board, foil; s s i n e; cello- ne; plastics in- d i n g acetate, n, polyethyl- saran, poly- r, Pliofilm.	Short and medium runs of from 25,000 to 100,000 impressions.	Coated paper—600 ft. per min. Cellophane—500 ft. per min. Polyethylene—400 ft. per min. Foil—400 ft. per min. Boxboard and paperboard—1 color: 300 to 400 ft. per min.; 4 colors: 200 to 300 ft. per min. Acetate—200 ft. per min.	Economical printing of films — brightness is unequalled at comparable cost. For printing "stretchy" plastic films or runs with frequent slug changes. For upgrading coarse board. For economical linework and printing large solids.	Possibilities of in-line operations are endless. Provides sparkle and good coverage on coarse stock. Copy changes are possible even during run; low plate cost; quick change-over.	Inks have low viscosity and make it hard to get sharp images and screen work. Fine type has a tendency to fill in.
ss, paper, plas- foil, textiles, ptable to all ls of materi- all sizes and es).	Per hour: automatic presses, 1,500 sheets and up; semi-automatic, 700 to 1,500; hand, minimum run.	2,200 impressions per hour attainable on fully automatic presses.	For sampling, specialty jobs involving unusual surfaces. Especially practical for heavy lay-down of ink required for fired-on labeling of glass; also for opaques, metallics and fluorescent inks.	Low-cost make-ready; economy of stencil making; small investment in equipment; flexibility; changes and corrections can be made with comparatively little problem.	Has certain limitations in regard to speed and length of run.
h, wood fibre, er, leather, soft hard plastics. l rubber, most r materials.	Special-purpose process.	Up to 40 impressions a minute, depending on materials being stamped.	Imprinting additional information such as flavor on preprinted stock cartons. Permanent marks on difficult surfaces; gold and silver imprints.	Simple operation can be fitted into package production line; quick change-over.	Special-purpose process.
ss, leather, plas- metal, china.	Special-purpose process.	Semi-automatic operation can apply about 40 decals a min.; often a hand operation.	Odd shapes; labeling products or packages that do not lend themselves to press operations.	Greater freedom of selection of colors and designs for difficult shapes.	Special-purpose process.
t transparent kaging films, ed papers, lac- red foils; most tics, glass, lac- red metals, board, etc.	Packaging applications 100,000 up; plastic articles, 50,000 up.	Packaging applications to 200 per minute; cartons to 100 per minute; plastic lids to 75 per minute; plastic bottles to 100 per minute.	Economical decoration of plastic bottles, covers, etc. To economically add promotional copy or correct obsolete copy; to eliminate preprinting on packaging materials.	Gives a direct printing effect at the packaging station. Designed for high speed, automatic application, economic cost.	With packaging materials, copy must be relatively compact for full economy. This limitation does not apply to plastic articles. Not amenable to hand application.

See other side for "Checklist of Requirements for Package Printing"

Checklist of requirements for package printing

Listed here are some major items of information a packager should give to the printer. Modifications of this general list can be made in accordance with the packager's specific requirements to assure that planning and supplier liaison proceed efficiently.

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Basic information for this checklist supplied by Milprint, Inc., Milwaukee, Wisc.

PR

Product name or designation

Product end use

How merchandised and distributed

Major characteristics of product are

Size:

dimensions

Essential protective needs:

ter

odor

moisture protection

against light

Is visibility or opacity required

Will product be processed in package:

sterilization

refrigeration

Average shelf life

Distribution:

East

West

PA

Style of package:

regular

Special characteristics (feeling of thrift, sa

Package type or component:

bag

set-up box

metal

Style of construction

PRODUCT

_____

_____

_____

_____

buted _____

_____

uct are _____

_____

as _____ net weight _____ unit quantity packed

_____ temperature extremes _____ greaseproofness

or _____ flavor _____ breathing

on _____ moisture retention _____ against air

nt _____ other

red _____

ckage:

on _____ freezing _____ cooking

on _____ other

_____

ast _____ Middle West _____ South

est _____ foreign

PACKAGE

_____ gift _____ seasonal _____ luxury

ng of thrift, sanitary, tradition, etc.) _____

_____

:

ag _____ envelope or pouch _____ folding carton

ox _____ label _____ glass

tal _____ plastic _____ shipping carton

_____ other

_____

Package—continued

Filling machine _____

Labeling machine _____

Closing machine _____

Other machines _____

_____

Is packaging:

_____ manual _____ semi-automatic _____ automatic

Type of closure:

_____ heat seal _____ direct heat _____

_____ serrated _____ elliptical lip _____

_____ thumb notch _____

Adhesive seal:

_____ dextrin _____ animal _____ resin

Temperature extremes to which package will be subjected: _____

Cycling or seasonal changes _____

_____

Unusual conditions of handling to be encountered _____

_____

Package is produced in what sizes and variations _____

_____

Is package member of a family design _____

PRINTING

Order is:

_____ new _____ repeat _____

Quantity needed:

_____ initial order _____

_____ expa

Printing surface:

_____ paper _____ type of paper _____

_____ plastic _____ type of plastic _____

_____ paperboard _____

_____

Process:

_____ letterpress _____ offset _____

_____ flexography _____ screen _____

Printing—continued

*Type of plate*_____

Color:

_____single color _____multicolor _____white stock

_____color stock _____transparent material

_____other

*Ink color numbers*_____

Position of printing:

_____outside surface _____inside surface _____sandwiched

Art work:

_____transparency _____color print _____black and white

_____other

*Color match requirements*_____

Size specifications:

_____dimensions _____cutoff _____web width

Special effects:

_____bleed _____embossing _____coating

_____other

Flexibility requirements:

_____slug change _____frequent design change

*What quality control requirements must the printing meet?*_____

*Have written specifications been completed*_____

*Are samples to be submitted*_____

PACKING

*Have packing instructions been prepared*_____

*What is quantity of basic shipping unit*_____

*Type of shipping container*_____

*Is shipment to be made on pallets (type, etc.)*_____

*Will your equipment handle:*_____loads to 2,000 lbs._____over 2,000 lbs.

*Method of shipment*_____

*Delivery schedule*_____

623-624

See other side for chart "Printing Methods for Packagers"

Heat-transfer printing

by E. P. Lingham, Jr.*

The heat-transfer method[1] now makes practical direct-printing effects at labeling costs on a wide range of materials (see printing chart, p. 621).

Labeling flexible materials. Companies that have integrated heat-transfer (or "hot-transfer") labeling with their packaging operations are using it to both supplement and replace preprinting of films, foils, papers and flat-folded cartons. As a supplement, it is used for the last-minute addition of special prices, premium offers and other variable information; also for overprint correction of obsolete copy to salvage costly inventories of preprinted materials. As a replacement for preprinted packaging materials, it eliminates the cost of heavy inventories and the risk of obsolescence. Cost-wise, heat-transfer labeling has advantages over preprinting, especially when the legend can be confined to a relatively compact area.

Heat transfer to packaging webs is effected by a special applicator integrally mounted on the packaging machine. Its drive is obtained from the parent machine and its feed is synchronized with the leading edge of the overwrap or to preprinted copy to obtain proper register of the transfers. Transfer speeds up to 150 imprints a minute are obtainable, depending, of course, on length of feed.

When mounted on suitable feeding equipment, the applicator also affixes heat transfers to flat-folded cartons and to such flat plastic units as polystyrene tape dispensers, polypropylene boxes and lids. Speeds vary with container size and material.

Multicolor on plastic bottles. Users of heat-transfer decorating on plastic bottles have reported savings up to 75% of the cost of direct application of color. Since it applies all colors with a single pass, the greater the number of colors the greater the savings. In color depth, too, the method provides favorable comparisons.

Cost reductions inherent in multicolor decorating of bottles by heat-transfer labeling already have had an effect on volume users of bottles. In the highly competitive detergents field, this newer graphic art has played a part in the switch to blown high-density and standard-density containers.[2] It has progressed from a slow, hand-fed, filled-bottle process to a fully automatic, high-speed decorating process in a relatively short time.[3]

Progress in heat-transfer decorating is still continuing. Most recent development is the perfection of a heat-release coating so colorless and transparent its halo within the transfer area is detected only by close scrutiny.

Heat-transfer decorating of bottles, quite naturally, calls for more complex equipment than that used for decorating packaging webs and flat units. It consists of a bottle-decorating machine, suitable turrets, transfer devices and a post-heating oven. This equipment is now performing successfully in a number of installations—at a contract packaging plant, in several bottle-molding plants, and in plants of volume-users of decorated containers.

Bottle-decorating speeds vary with bottle sizes. Standard 1¼-oz. ovals can be decorated as fast as 100 a minute and upwards, and 32-oz. rounds at approximately 35 a minute. The maximum decorating rate is a function of the 1,000-inches-a-minute maximum speed of the paper carrier. This is the fastest speed at which the paper can travel and still allow the hot platen to activate the heat-release coating.

Turrets already have been designed for a wide range of bottles and sizes. Each new size and shape, of course, calls for a new turret design.

To assure proper adhesion of heat-transfer labels to polyethylene bottles, they must be previously heat-treated. This practice, as is known, applies to all other methods of bottle decorating.

Why post heating? Its purpose is not to dry the transfers, since they are immediately dry on application. However, post heating is *desirable* on standard-density polyethylene bottles to glaze the transfer and improve adhesion. It is *compulsory* on high-density polyethylene to guarantee lifetime adhesion.

Heat-transfer decorations are available in two types of colorless heat-release coatings: high-gloss and matte. The former is commonly used for standard-density polyethylene and the latter for dull-surfaced high-density polyethylene. These alternatives provide decorations that blend properly into any bottle's texture and thus enhance the direct-printing effect.

Fortunately for firms lacking enough volume to justify in-plant decorating, several bottle molders are equipped to offer heat-transfer labeling. Others are in the process of adding the service.

At what volume does heat-transfer decorating offer economic advantages? Cost analyses have established 100,000 on rounds and 50,000 on ovals as the point where real savings start.



SHAPES and designs in great variety lend themselves to heat-transfer labeling, as illustrated by the direct-printed plastic bottles here. *(Dennison photo)*

* Dennison Mfg. Co., Framingham, Mass.
1 A Dennison process called "Therimage."

2 See "Big Push on Plastics," MODERN PACKAGING, Oct., 1959, p. 109.
3 See "Transfer Labeling of Squeeze Bottles," MODERN PACKAGING, April, 1958, p. 106; and "Transfer Labeling in the Round," MODERN PACKAGING, May, 1959, p. 108.



VITALITY keynotes surface treatment of these small-size packages. Colors virtually run from one end of the spectrum to the other—and themes from appetite appeal to fun for children. Some of the most expert use of graphic arts in packaging is for cereals. *(Sun Chemical photo)*



NEON-LIKE QUALITY was added to Tide cartons by use of daylight fluorescent inks for the darker colors in rings. Inks of this type are compatible with conventional gravure inks, have more light stability and fade resistance, and allow one-impression web-fed printing. *(Packaging Corp. of America photo)*

Suiting printing ink to the package

by Weldon R. Coate*

For packaging people, the facts about printing ink not only represent a revelation; they also disclose the reality that some knowledge of printing ink can be exceedingly helpful in getting the most out of packaging display opportunities—and in avoiding costly mistakes in executing designs.

The printing ink industry represents a dollar volume in excess of $240 million worth of final product. This is distributed among the various printing processes as follows: letterpress, $119 million; lithography, $45 million; publication gravure, $10 million; packaging gravure, $20 million; flexography, $35 million; news black, $14 million; news color, $7 million.

Printing-ink manufacturers tend to specialize either in standard printing inks or in custom formulations. Some manufacturers find their line is 80% or more in standard mixtures; at the other extreme, some find they may be producing 80% or more in custom formulations. No matter what the breakdown, the large portion of the industry's custom formulations makes one fact stand out: printing ink production is a service industry at least as much as it is a manufacturing field.

In the packaging field, printing is done by letterpress, offset, flexography, gravure and screen process. For each of these processes there must be printing inks with characteristic basic formulations. But within such generic formulas are infinitely complex variations. There is no such thing as a single "offset black," for example. The offset ink used for printing in a simple office duplicating machine is far different from the offset ink used, for example, in the very latest Rutherford can printer capable of printing 200 cylindrical cans a minute. The offset ink adapted to printing on flat rigid surfaces is a far different formulation than one used to print on packaging material that will be bent and twisted by the consumer.

For packaging, printing ink makes it possible to achieve desired results in distinctive coloring, decoration, presentation of instantly recognizable words and symbols, and, often, added protection for packaging material.

To fulfill its role in packaging, printing ink must possess a number of characteristics. These include:

1. *Light fastness.* Thirty years ago color printing on packages either faded fast in store window displays—or the colors were drab and unattractive to begin with. The light-fast requirements of the packaging world definitely spurred the printing ink industry into developing colored inks that would not fade—that would withstand continuous, daily assault of both sunlight and incandescent light.

The importance of light fastness is underlined by the fact that light can fade the entire exposed surfaces of packages not printed with non-fading inks. Too, packages partly hidden by other packages can be marred because those areas not protected by other packages can become faded.

This fading tendency can be eliminated completely within the normal life of the package. But ink suppliers warn packagers to consider specific end-use requirements in each case.

2. *Uniformity of color.* Akin to light fastness is the quality of color uniformity. In package printing, probably more than in any other branch

*General Manager, Graphic Arts Group, Sun Chemical Corp., New York City.

of graphic arts, precise control of color is vital. Purchasers of displayed products tend to shy away from such products if the colors on identical packages differ from one another—or if they differ from the shades observed and remembered at earlier purchases.

How is color uniformity maintained in packaging? Two safeguards are:

• The eye of a trained observer. The expert color checker can compare samples of new inks with standard samples and hold the tolerance between sample and new batch to a specified "LPD"—"least perceptible difference." Such "LPD" is established by the packaging buyer and represents the limit of difference (darker or lighter) that the customer will permit.

• More reliable, because it introduces a scientifically measurable condition, is the spectrophotometer. This is a reflectance-measuring instrument that compares colors with the aid of a photoelectric cell by measuring fine differences in light reflectance over the complete spectrum, thereby making a precise "fingerprint" of the particular color.

3. *Resistance to rubbing.* Resistance to abrasion is becoming more and more important in packaging as (a) more package printing is done and (b) increasing stress is given to point-of-purchase merchandising, with vast increases in the number and variety of packages displayed.

By no means "standard" in all inks available for packaging purposes, rub resistance is imparted by such ingredients in the ink as chlorinated rubber, nitrocellulose, ethyl cellulose, cyclized rubber, phenolic alkyd and maleic resins. Contributing to abrasion resistance also are such anti-friction compounds as polyethylene, hard synthetic waxes and silicone compounds.

Testing for abrasion resistance—like testing for color uniformity—is a measurable process, thanks to rub-testing devices developed within the past several years.

In thinking about rub resistance, the package-printing buyer must never overlook the fact that paper itself is an abrasive. Mere contact—paper against paper, or paper against hard materials—will take a toll upon inks not fortified against rubbing.

4. *Temperature resistance.* Printing ink for many package uses must stand up to extremes in temperature which no printing ink available 30 years ago could have resisted. The range for one temperature-resistant ink runs from 20 deg. F. below zero to 415 deg. F. For another application, printing ink must stand up to 650 deg. F. heat for short durations. Despite punishment of this kind, printing ink must maintain color, bond and texture; it must resist any tendency to embrittle, flake, melt, peel or burn.

In large measure, synthetic high-polymer materials offer opportunities for heat resistance. To the printing-ink manufacturer, the challenge of temperature resistance underlines again the need to maintain custom research to find new ink-making ingredients that can impart qualities not previously attainable.

Packaging requirements which present some of the toughest problems include those of the frozen-food industry and the cook-in-the-wrapper packing field. For some branches of frozen food handling, as an example, the packaged product must first be sterilized at 360 deg. F. for up to 30 minutes. At the same time, the food in its printed wrapper stands in an atmosphere of hot water under pressure, or wet steam. From such extremes of heat and moisture, the food, still in a printed container, must be plunged into temperatures that drop to the cold of "quick freeze."

It is possible to obtain printing ink that will withstand any range of temperature likely to be imposed upon food. But again, the admonition is: be sure all parties, ink maker and printer, are informed concerning end use (and abuse) and in-process rigors.

5. *Solvent-resistance.* Printing inks must be able to withstand the dissolving effects of (a) the contained product and (b) products (solids, liquids and gases) that may be encountered in ordinary transit, normal storage, and end use.

Ingredients which give modern printing inks their resistance to the inroads of solvents are many and varied. There is no single chemical or family of chemicals which imparts solvent resistance per se. The dissolving medium is the determining factor. Selection of a formulation to resist the solvents is usually a "custom" problem for the ink maker's research chemists.

Illustrative of the problem, consider the following:

Boxes of soap flakes (or soap wrappers), handled with wet hands, are bombarded with highly corrosive alkalies and detergents. Ink must be formulated to resist such chemicals.

Photo chemicals, salad dressings and certain food products (such as vinegar) contain acid. Here the ink formulation must be acid resistant.

Trade customs in shipping and storage often contribute additional complications even when the contained material poses no dissolving problem. For example, boxes of inert fibre gaskets may need to be printed with an oil-resistant ink because such boxes may stand in the storage rooms in an oil-laden atmosphere, or adjacent to oil-bearing materials. And this must be anticipated, even when the product in the package offers no problem.

Similarly, cigarette packages provide an interesting study. With cellophane protective sheathing around the usual paper pack, the ink normally does not need to be abrasion resistant. But it does need to be resistant to any liquid materials in the cigarette package. And more: it must be resistant to alcohol because cigarette users so often are alcohol users also. Liquor spilled on a cigarette package could spoil repeat sales for the cigarettes—if the ink on the pack should run.

6. *Permanence of bond.* The adhesion of ink to packaging material is an increasingly important consideration as progress in the packaging field pushes containers into many kinds of new uses (and abuses).

The neat, pampered box with varnished or cellophane-wrapped surfaces which is given tender care from producer to purchaser is in the minority among packagers nowadays.

Fast packing, fast shipping and speedy turnover at the retailing end impose upon even rigid-seeming packages a great variety of vibrations, twistings, pressures from above and below, and temperature-imposed contractions and expansions. And when you come to packages which are designed to be squeezed, twisted, pulled and stretched, the challenge to printing-ink bonding is tremendous.

For the packager, advice in this category is simply this: *show* printer and printing ink supplier what the package will need to sustain in the way of changes in shape and flatness of the printed surface.

7. *Freedom from odor.* Increasingly, printing inks for packaging are being challenged to deodorize themselves. This is especially true in the case of food products, and some are particular problems because of a tendency to pick up and retain odors.

Decorative and gift packaging

The gift-buying habits of today's bountiful yet practical American family have greatly increased the scope and volume of the gift-packaging market. Items once considered unlikely as gift purchases now easily find their way onto gift lists. Concurrent with the increased gift-packaging market is the increasing variety of materials and techniques becoming available.

Naturally, the gift-buying habits do not account for the entire growth picture. Our increasing population—now near 185,000,000—certainly contributes to the rising volume.

Continuing upsurge in overseas travel, with U. S. residents now spending more than $2 billion for foreign travel, increases the demand for "going away" gifts.

Gift and decorative wrapping at factory level which adds value to items as gifts—sometimes leading to customers "gifting" themselves—accounts for some of the growth of the market.

Statistics

Gift-buying statistics, such as those shown in the table on page 629, are evidence of the vastness of this ever-growing market. Broken down by holiday and special occasions, the sum total graphically illustrates the tremendous scope of this multi-billion-dollar market.

Birthday gift volume can be estimated on the basis of two gifts a year for each person. This means that nearly 1 million presents are purchased for this purpose *every day* of the year.

The annual birth rate of more than 4 million adds at least one gift per new baby to the yearly gift volume—and one gift probably is a gross understatement.

Weddings increase in number as the population grows, and it has been estimated that by 1965 they will reach 1,960,000 a year.

Although the Christmas gift figure is given at about $7.5 billion, marketing authorities recognize that the entire period from before Thanksgiving through New Year's Eve is a period of increased spending, amounting to several times the total for Christmas gifts alone. Many items purchased during this period of intensive buying lend themselves to special gift and holiday treatments and thus can capitalize on the increased buying stimuli that exist during this time.

Two major gift-giving occasions are Mother's Day and Father's Day. These two events alone provide a market estimated in excess of $1 billion. The products that traditionally benefit are candy, toiletries, jewelry, apparel and appliances. Skillful packaging approaches, however, are extending both the variety and the extent of this important market.

Then there are other perennials—Easter, Valentine's Day, Thanksgiving, Fourth of July, St. Patrick's Day, Halloween, New Year's Day—plus the ever-occurring gifting for graduations, travel, hospitalized people, showers, anniversaries and the like.

All these provide opportunities for gift-package treatment. And proper gift packaging has become the determining factor in many thousands of purchases—heavily influencing shopper choice.

Planning considerations

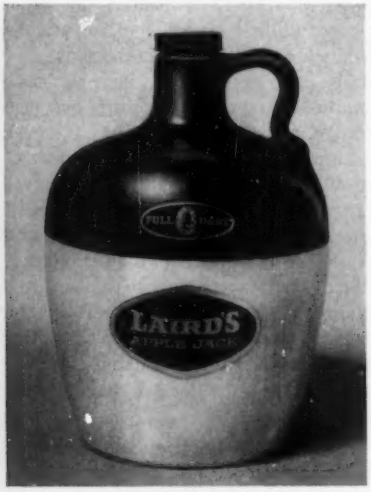
As increased merchandising demands and competition produce more imaginative and attractive designs and constructions, the distinction between everyday and gift-appeal packaging tends to become less obvious. Thus, the production of a special-occasion package for gift presentation becomes more and more challenging to the ingenuity of both the manufacturer and the packager.

There are several broad, basic principles important for packagers to consider in adapting decorative and gift packaging to today's selling requirements. They call for answers to questions such as:

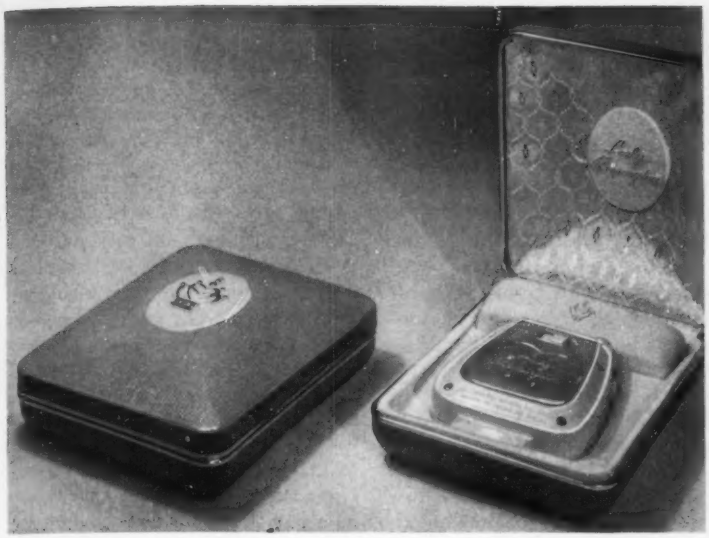
1. Is there any way to take the guesswork out of planning for gift packaging?
2. What kind of gift packaging is competition using? How will our package stack up against it?
3. How often should a gift package be redesigned? Can a successful one be repeated, or is it better to offer a new one?
4. Will a particular gift package be easy for stores to handle?
5. Should the package be planned for year-round gift appeal or for a strictly seasonal or special-occasion one? Is there a way to accommodate the packaging to both?
6. What specific appeal is to be



WRAPS, printed with ornate black and white illustrations, lend air of elegance to inside as well as outside of Coty gift set boxes. *(Box wraps, The House of Harley)*



STONEWARE jug, used here for apple jack, is popular as gift or souvenir package for cheese, butter, syrup and nonfoods. *(Western Stoneware photo)*



METAL CASE with simulated leather cover combined with a brocade lining provides practical luxury package for Lady Remington shaver. *(Farrington photo)*



BON VOYAGE paper makes gala year-round gift package. *(Chicago Printed String photo)*

made, such as: quality impression; novelty; practical; out-of-the-ordinary; cute; humorous; pretty; for travel; for children?

7. What is the best way to provide for seasonal packages to be converted to regular stock when the special-season selling is over? Will removable film or paper sleeves and wraps serve this purpose best?

While it may not be possible to eliminate guesswork completely in the planning, there are some pitfalls which can be avoided easily. For example, the type of item customers will want to handle and retailers will want to show in open display should not be in a closed, sealed package. Packages not sturdy enough to stand up under handling—which need constant fixing or become damaged or unsalable—are irritating and costly to the retailer. Unnecessarily bulky packages will not have favorable reception by retailers in this day when every inch of space must produce a set volume of sales results. Items packaged in quantity or in groups must not be out of line with current prices and today's consumer preferences.

Maximum display potential is essential in outlets with self-selling practices. A shopper often will pass up one item and choose another from among competing lines simply because the gift-type package stands out from the others. Too, a package with special appeal may be accorded better display space. While pre-testing in outlets is the best method of determining consumer appeal, this is not always practical for the gift packager. Many firms rely on the reaction of their salesmen because of their knowledge of actual selling environment.

The repetition of a successful package from season to season is a general practice in most merchandising, but it is not necessarily the wisest course in gift packaging. The appeal of "something new" is universal, and comes through most strongly in the case of gifts. For that reason, many firms launch new gift packages at least once a year and some of them for each seasonal promotion. Cigarette companies, for example, redesign their Christmas gift cartons each year. The liquor industry is almost as ambitious in gift packaging as the cosmetic industry, judging by their seasonal use of elaborately printed and decorated wraps and cartons and of expensive decanter bottles.

Whether a gift package should be planned for year-round appeal or for a special season is largely a matter of meeting the requirements of the merchandising program of the product. The gift package to meet any occasion is economical for the manufacturer and also means the retailer will not be left with outmoded stock on his hands. This type of packaging is most

Annual gift market*

Gift-giving holiday or special occasion	*Number of gifts and related sales*	*Sales volume*
Holiday		
Christmas	1,500,000,000	$7,500,000,000
Mother's Day	180,000,000	900,000,000
Easter	54,000,000	350,000,000
Father's Day	76,000,000	380,000,000
Valentine's Day	60,000,000	120,000,000
Special occasion		
Birthday gifts	355,000,000	1,775,000,000
Wedding gifts	1	1,580,000,000
Anniversary gifts	69,000,000	345,000,000
Shower gifts	15,800,000	79,000,000
New-baby gifts	12,000,000	60,000,000
Graduation gifts	4,000,000	20,000,000
Total	2,325,800,000 (plus)	$13,029,000,000

* Some of these markets cannot be accurately measured. Where market research figures were available, they have been used. In some instances figures are based on population estimates and an arbitrary number of one or two gifts per person, per occasion, @ $2 to $5.
1 One source estimates wedding gift expenditures at approximately $1,000 per bride with the estimated marriages for 1961 at 1,580,000.

practical for products such as household items, silverware, baby items, etc. In other lines it may seriously limit the sales potential in big gift seasons because of the lack of a seasonal look.

Compromise measures can solve this problem in some cases. Sleeves or wraps, or stretchable plastic ribbon, for example, can carry a seasonal tie-in and be removed at the season's end.

Current trends in gift packaging should be watched. Aerosols are an important upcomer, and are being used for an increasing number of products—in gifts, notably for toiletries. Multipacks are providing greater gift appeal—with combinations such as a lighter with two packs of cigarettes, a lipstick with a compact, a selection of foods. There is a definite trend at present toward more elegance or richness in the packaging of products for men; real or simulated leather, gold tooling, handsome re-use boxes and the like are enjoying wider application. The "extra use" feature, such as a lady's electric shaver packaged in a luxurious evening bag, is on the march.

Planning the packaging of gifts for children involves a two-way consideration which differs from that of other gift categories. Since gifts for children usually are purchased by adults, package appeal needs to be beamed at both. It is such a tremendous market that special care in package design is well worth extra trouble. And the "exploding" population is multiplying the volume of gifts for the younger set.

Showcasing the product with a see-through window enables the purchaser to determine easily the suitability of the item for the child; this is true of both toys and clothing. It also adds to the impact on the recipient. An example is the die-cut window on crayon boxes which reveals the variety of crayons. Acetate bubbles for sporting goods and toys serve the same end.

In the case of clothing items, statistics about size, style, color, etc., are essential. Also, any unusual features which add to gift appeal should be clearly noted, particularly with toys.

Illustrations and designs have stronger appeal to children when they incorporate some element which is timely or in the nature of a current fad—such as space travel, a TV personality or other idol, westerns. Children like to identify themselves or their activities with the product. And it should be borne in mind that all children are attracted by bright colors.

Materials

In an age when nearly every manufacturer is package-conscious and striving to add sales appeal to the most prosaic of packages by manipulating color, surface design and texture and form, the element that gives definition to decorative packaging is mostly a matter of emphasis.

Decorative packaging uses all the standard packaging materials—paper, paperboard, glass, ceramics, cellophane, plastic, metal, wood, leather, tags, seals, ribbons and ties.

Paperboard. The enormous range of products decoratively packaged in folding cartons, set-up boxes, fibre cylinders and corrugated constructions is testimony to the practicality of paperboard as an inexpensive and sturdy packaging material. Paperboard can be cut, stamped, scored and decorated automatically at high speeds.

Fancy papers. Paper is perhaps the most diversified material used in decorative packaging. It is relatively low in cost, plentiful and easily given a decorative appearance. It can be laminated with other decorative materials or treated texturally in any number of ways. (See also article on page 86.)

Metalized paper. A thin coat of aluminum, applied by a vacuum-deposition method, transforms paper into a wrapping material virtually indistinguishable from foil. The method employs only a fraction of the metal used for laminating foil and, reportedly, costs considerably less. The amount of saving depends on the base stock selected. The metal coating, applied to appropriate types of paper, will provide all the assets needed for decorative packaging. The material will take the same printing inks and processes as foil.

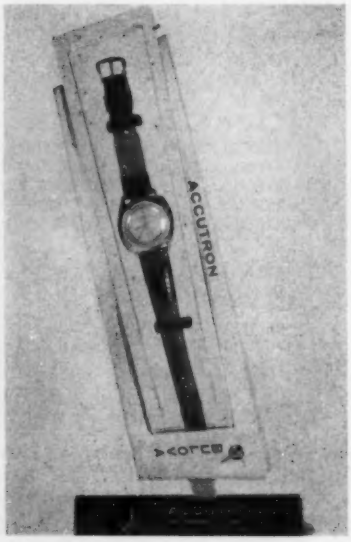
Foil finds innumerable decorative applications because of its brilliance and moldability. Gorgeously printed and embossed foil papers are ideal cover stocks for many elaborate set-up boxes packaging products such as cosmetic powders, perfumes and candies.

Films. The transparency of films can be exploited most advantageously for decorative treatments where the product best sells itself. However, the brilliant printing developed for these materials offers special effects which combine the mirror finish of film and many bright color combinations.

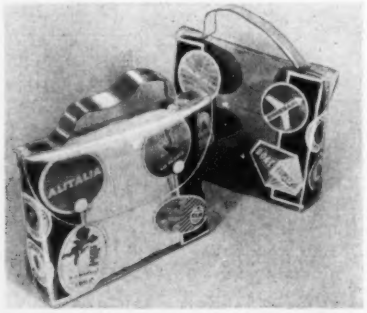
Glass is the ideal decorative packaging medium for products whose color or texture can be used as part of the decoration. It is especially appropriate for specialty foods and beverages, colognes, lotions and perfumes. In addition to offering transparency which allows light to pass through translucent liquids like wine, glass refracts light from its own surface and can be blown in faceted shapes and designs that multiply reflection.

Thermoformed plastics play a role in decorative packaging with containers that achieve quality textured effects imitating other materials at much lower costs. Blisters and skin packs lend themselves to unusual shapes, showcase-display effects and many novel or functional treatments.

Flocked polystyrene sheets are used

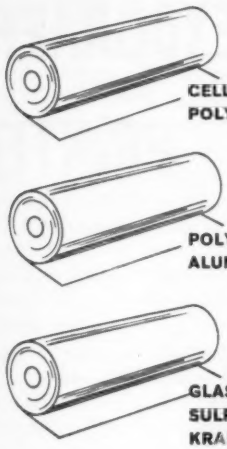


PACKAGE-DISPLAY unit's tuning fork motif reflects space-age newness of watch with tuning fork mechanism like that used in U. S. satellites. *(Case, display attachment, Arrow Mfg.)*



RE-USABLE clear vinyl case merchandises lingerie, shoes, etc. Travel theme depicted by color insert of airlines insignia. Other inserts available. *(Vimo photo)*

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For converting polyethylene tubing into bottom sealed poly bags. (Poly-Matador Bag Machine)

For the manufacture of handle bags and so-called "carry-bags".



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- — sewn valve bags up to six plies
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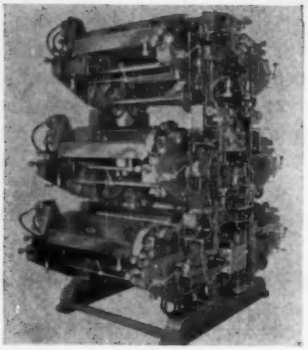
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(2) Wolverine Hydro-Line—A heavy duty machine similar in construction to the Hydro-Printer, designed for in-line operation with bag machines, extruders, sheeters and other converting equipment. Equipped with 360 degree register controls on each color station and push-button controls to permit changeover on color units while press is in operation. Available with two to four printing (color) units, widths 24" to 41". Standard repeat of 10" to 40" or 10" to 60". Equipped with hydraulic plate cylinder lifts and constant running ink fountains.

(3) Wolverine Flexographic Printing Unit—Built for direct hook up to bag machines, sheeters, slitters, laminators, gumming machines and other converting equipment. The color stations are identical in design to the Hydro-Printer. Available with one or two printing (color) units, widths 24" to 91". Standard repeat of 10" to 40" or 10" to 60". Equipped with either manual or air cylinder plate lifts and constant running ink fountains.

(4) Wolverine Flexo-Printer—A sturdy, medium duty machine available with two to four printing (color) units, 31" wide. Standard repeat of 10" to 30". Machine is equipped with manual plate cylinder lifts and constant running ink fountains. The Flexo-Printer can be used for roll to roll printing or as an in-line machine with converting equipment.

(5) Wolverine Cub-Line—A medium duty in-line operating machine designed for in-line operation with bag machines, extruders, sheeters, laminators and other converting equipment. Equipped with a unique 360 degree register control on all color stations and push-button controls to permit changeovers on color units while press is in operation. Available with two to five printing (color) units with built in reserve prnting features. Built in standard widths of 21" to 31", with a standard repeat of 10" to 30".

(6) Wolverine Cub-Printer Model X-120—The ideal machine for small width printing. Available with one or two printing (color) units, widths 6" to 26". Standard repeat of 10" to 30". Equipped with an overhead structure and gas fired dryer. Machine is equipped with manual plate cylinder lifts and constant running ink fountains.

(7) Wolverine Cub-Printer Standard Model—Identical in design to the X-120 Model except that it does not have the overhead structure or gas fired dryer. Comes equipped with a built in oven and open flame dryer.

(8) Wolverine Cub Flexographic Printing Unit—Built for direct hook up to all types of converting equipment. Color stations are identical in design to Cub-Printer. Available with one or two printing (color) units, width 6" to 26". Standard repeat of 10" to 30". Machine is equipped with manual plate cylinder lifts and constant running ink fountains.

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effectively for vacuum-formed packages. The sheets maintain their velvety finish even at the point of deepest draw. Available in a wide range of brilliant colors and in various thicknesses and sheet sizes, they provide handsome appearance, long wear.

Molded plastics have contributed many decorative packages and package components. The nature of the material lends itself to virtually unlimited design possibilities which have been exploited for a wide variety of luxury and nonluxury items.

Molded-plastic presentation boxes lined with luxury fabrics serve as the gift package for watches, jewelry and accessories such as lighters. They can be designed to bring out their own intrinsic qualities in a number of colors to imitate other materials such as ivory, tortoise shell, metal or wood.

Increased use of stock-molded transparent plastic packages has added sales impetus to many novelty and gift items. Direct printing on stock boxes adds a custom touch.

Plastic closures are an important component of many distinctive packages. Stock designs in great variety carry out striking color schemes or decorative patterns, while private designs usually express a product motif.

Protective materials

Material which serves the dual purpose of protection and decoration is available for many different types of packaging.

Embossed glassines, quilted, waxed and featherweight corrugated papers provide protection plus ornamentation for confectionery, specialty foods, jewelry, cosmetics and toiletries. In some treatments, decorative papers used as cover material for set-up and presentation boxes provide grease- and waterproofness—not possible with silks and satins.

The flocked materials, important as a decorative material, also act as a protective cushioning for delicate and valuable parts and products. For silverware, it is available also in tarnish-resistant material.

Shredded foil, like shredded film, paper and laminations, is used in food and candy packaging, where even the greaseproof cushion needed for product protection must be decorative.

Molded pulp, in combination with velour, flocks and other surface treatments, is used successfully for inexpensive bases and platforms.

Plastic foam, in addition to its at-

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tractive appearance, does excellent service for protective shipping. It can be fabricated or molded and is also available in the form of extruded sheet. (See also page 287.) The foams offer many new opportunities and warrant much increased study.

Special materials

Certain products which rely heavily on the gift market for sales volume make use of packaging media which are gifts in themselves.

Ceramics offer some of the most charming and prized re-use containers. Each year simple variations on a few basic forms—the jug, the pot, the bowl, the vase, the ash tray, the figurine—find a favored place on retailers' shelves in a full range of colors.

Metal containers, too, have high re-use potentials in addition to offering long-lived protection to the specialty foods they package. They will withstand severe handling in storage and transit.

Metal can be stamped and embossed so that designs are thrown into relief, giving sculptured, encrusted or appliquéd effects to simulate carved ivory, cinnabar, mosaic, cloisonne and the like. Friction-fit, plug-in and hinge-action lids are used.

Often a general-line can is adapted with a minimum of effort and cost. Beautifully lithographed metal cans used in gift packaging of fruit cakes and candies are obtainable in stock shapes, sizes and designs from a number of the smaller can companies and from distributors who handle imported designs. Private designs can be lithographed where desired.

Wood packages are perennially salesworthy. For fruits, candy and other expendable products, boxes, baskets and miniature barrels can be given special effects to create exactly the feeling desired—a rough-hewn style for a rustic theme, highly polished surfaces for quality, as well as unusual designs for novelty.

Wood is used in a great variety of dispenser trays, chests, hampers and odd-shaped boxes for liquors, cheese, dried fruit and such specialty put-ups as sewing kits, spice and seasoning sets, picnic equipment, luxury games, and perfume and fine soaps.

Flock. The note of luxury supplied by any type of flock is particularly effective in packaging items like silverware, salt and pepper shakers, men's belts or cuff links (see "Fancy Papers," p. 86). Flock is relatively inexpen-

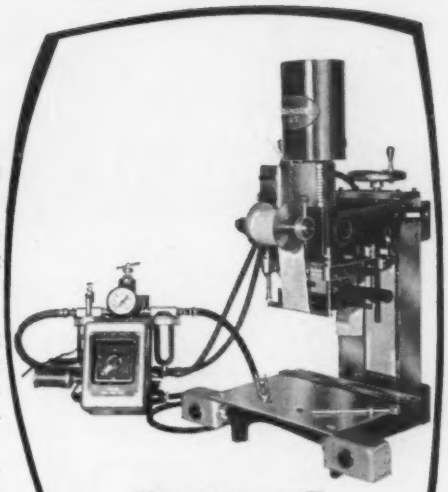
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HOT STAMPING EQUIPMENT

Kensol Presses are available in three pressure ranges: Light-Weight (½ ton), Medium-Weight (3½ ton), and Heavy-Duty (4-7 ton).

A model can be supplied to meet any production requirements: Hand-operated, Air-operated, Semi-automatic, and Completely automatic.

Compressed air-operation, adjustable electric dwell-timer, thermostatic heat control, and rugged construction are a few of the features which assure quality marking.



KENSOL 15T
Light-Weight
Air-Operated Power Press

Write for complete literature!

KENSOL-OLSENMARK, INC.
124-132 White St. • New York 13, N. Y.
Specialists in Quality Marking Equipment and Supplies for over 30 years

and OLSENMARK ROLL LEAF
Fine uniform quality, economically priced roll leaf in genuine gold, high luster imitation gold and silver, and both flat and Enamel pigment colors.

Decorate or Print
DIRECTLY ON YOUR PRODUCT ....AND SAVE!



with APEX
Decorating & Marking Equipment

PRINT WHILE YOU PACKAGE

- 1, 2 or more colors in perfect register — on flexible or rigid plastic, paper, glass, metal, etc.
- automatic or hand feed machines — on all shapes, even after product is inside!
- rapid changeover
- inexpensive plates
- permanent inks in all colors

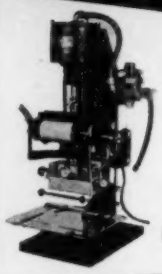
By printing directly on your package, an Apex printer eliminates your label inventory problems, relieves you from production headaches. Apex printers can be integrated into your packaging machine or line. Perfect for code marking, price marking, and labeling for foods, beverages, drugs, cosmetics, electronics, etc.

Send now for catalog with complete prices and data. For specific recommendation, please state shape and size of your product, daily production requirement.

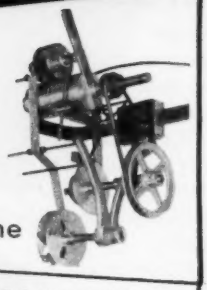
APEX MACHINE COMPANY
14-13 118th STREET COLLEGE POINT 56, N. Y.
Largest and Oldest Mfr. of Multicolor Ink Printing and Hot Stamping Machines



STAMP IT! CODE IT!
MARK IT! DATE IT!



with maximum
SPEED . . .
minimum
"DOWN-TIME"
right on your packaging line



ACKERMAN-GOULD'S Hot Stamping-Marking Machines are air operated . . . can be used for continuous flow or intermittent marking of any type package or wrapping material, containers, labels, etc. Marking heads can be quickly changed thus reducing production slowdowns.

ACKERMAN-GOULD Coding and Code-Dating Machines use Heat and Roll Leaf to Code frozen food and other packages. Imprinting is fast, clean and clear.

★ ★

Leave YOUR Mark With
ACKERMAN-GOULD

We supply all dies, fixtures, roll leaf required to add distinction and identity to your product.

a g **ackerman-gould company, inc.**
10 NEIL COURT, • P. O. BOX 188 • OCEANSIDE, L. I., NEW YORK

RCI

Something New has been added!

This message is NOT addressed to our many loyal customers who have visited our tailor-made plant in Palmyra, New Jersey. They KNOW we have the skilled craftsmen and ideal facilities for the production of top-quality gravure engravings *ON TIME* and *AT FAIR PRICES.*

And, they know that we have completely new, electronically controlled plating facilities "on stream"—turning out mirror-finish hard chrome under conditions of optimum quality control.

Yes, something NEW has been added to our modern facilities. When we have added *your* firm to our ever-growing list of satisfied customers, our next goal will have been reached. Test us, please!

Direct Long Distance Dial No.: 609-829-4585
Direct Wire: TWX Riverton (N. J.) 1174

ROTO CYLINDERS, Inc.

PALMYRA, NEW JERSEY *(A SUBURB OF PHILADELPHIA)*

sive and it comes in a rainbow of pastel and brilliant colors from light to dark, shiny or dull, and in two-tone effects or fluorescent colors.

Imitation leather and fabric. Flexible plastic sheeting, notably vinyl, has gained wide acceptance in low-price fitted cases, pouches and covered-fibre containers. Plaids and prints approximate an imported flannel or chintz; leather finishes imitate their models to the last stitch; and translucent "fabrics" in pastel shades widen the useful range.

Cloth. The success of cloth and leather imitations in plastic has renewed interest in the real thing. Cloth has a textural quality that lends itself to gift packaging.

Genuine leather has a classic use in the many luxury kits of personal accessories and toiletries for men and women, as well as in covered metal cases for watches and jewelry.

Decorative devices

A package can be transformed by the use of decorations—right into the gift-appeal area. Ribbons and ties are available in woven and nonwoven types—of cloth, paper, plastic and their laminations. They are finished like velvet, satin, lace or cord and come in many widths, colors and designs. Stretchable plastic ribbon, imprinted with a special-occasion message, can be used for single packages or to band matching items such as tie and socks, food specialties, items for smokers. Elaborately printed and embossed bands encircle single packages and multipacks, and can be printed with a gift message. If, however, these are used to close the package, they limit it to seasonal selling.

A handsome ribbon or cord provides a feeling of expendable luxury when, for example, it is glued by an overseal to the package wrap so the paper must be torn to open the package. Knotted off with fringe, pompons, tassels or bows, such fastenings are never a useless "extra."

All kinds of prefabricated bows and other finishing ornaments are available, and are easily attached to the knot of the tied package. Bows still are one of the most effective decorations and they no longer are prohibitive in price. There are mechanical devices for making them which gift packagers can have on their own premises or can rent. Bows also can be purchased completely fabricated—ready to be attached.

"We use FMC HUDSON SHARP Flexographic Presses *exclusively* in our production of top quality materials for packaging"

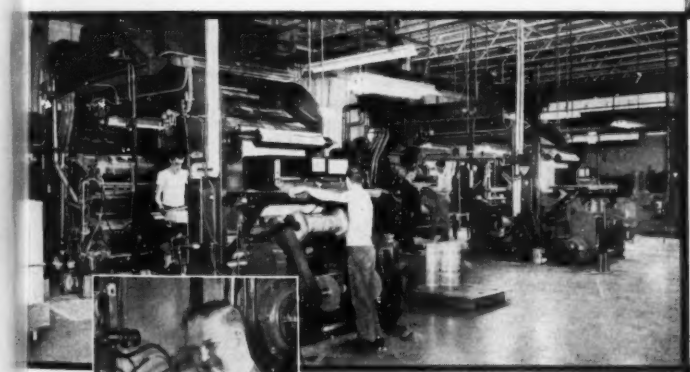
W. T. "Bill" Winn, *Chairman of the Board*
Cello-Vision Corporation, Minneapolis.



"Our experimental days are over" says Bill — "After first using presses of other manufacture we concluded only Hudson Sharp Single Impression Drum presses could meet our exacting demands for the finest quality color register printing on Poly, Cellophane and other film material."

H-S's latest press features are really something! • Dancer controlled electric brakes on unwind spindles for positive tension control from unwind to variable speed infeed • Push button automatic two-motor flying splice with provisions for winding print inside or outside • Air-loaded, score-type web slitters at rewind • Dove-tail ink roll and plate cylinder frame mountings for fine adjustment and absolute positive lock-up • Independent variable speed drive to fountain rolls • Water cooled impression drum • High velocity, jet-type, hot air dryers for maximum speeds consistent with newest inks and solvents • Additional chill rolls for back and front web cooling at highest running speeds • Other features available include: Automatically lubricated plate cylinder bearings; catwalk and elevated mounting for main drive motor and hydraulic reservoir; manual or electric plate cylinder hoists. Write today for more details on the industry's most productive press.

Cello Vision CORPORATION
MINNEAPOLIS MINNESOTA



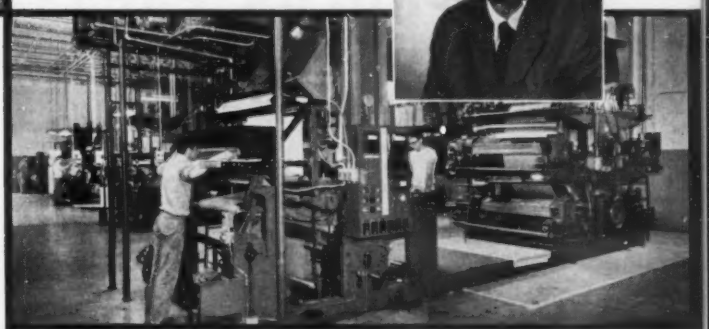
The press room of Cello-Vision Corporation, Minneapolis is completely Hudson-Sharp equipped. Foreground at left shows an A-4 press with 5th color added and another model A-4 directly to the right. At the extreme left (out of view) is a model A-5.



E. H. Rendahl, *Vice President*



R. J. Wesley, *President*



Newest H-S press at Cello-Vision is a model A-6, shown in the foreground at right. The Cello-Vision Corporation is one of the Midwest's prime producers of highest quality color screen process and line color printing on all types of films for packaging.

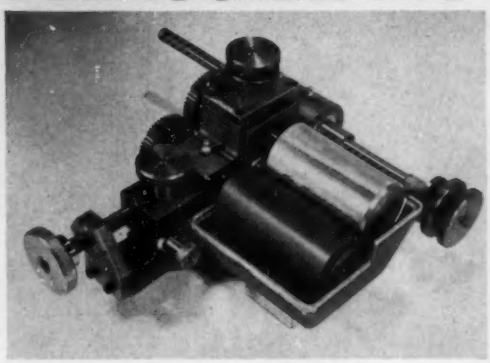
fmc CORPORATION

FMC CORPORATION

HUDSON-SHARP PLANT

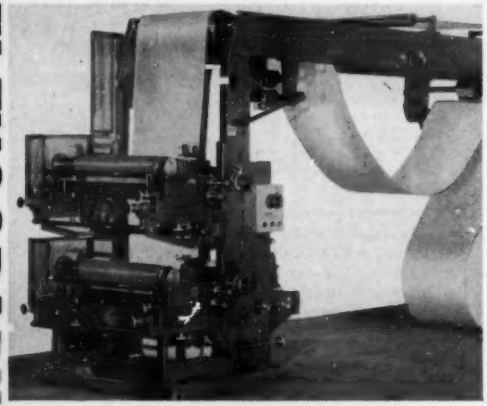
1201 Main Street, Green Bay, Wisconsin

FLEXOGRAPHIC EDGE PRINTER



One (1) color, 4-Inch Edge Printer designed to meet the most exacting specifications. This miniature press, a compact unit, will fill all requirements of edge printing. Precision engineered, ingeniously designed, it features an ink fountain, a two-piece casting that is non-splash and leak-proof. Built to operate in conjunction with other equipment, the simplicity of the Manhasset Edge Printer assures trouble-free, superlative performance, ease of operation, high quality printing. Many now in use here—and abroad. Re-orders attest to their success. Moderately priced, available on short order. Send for our brochure on all types of Flexographic Printers and Bag Machines which we tailor to your particular needs.

FLEXOGRAPHIC 2-COLOR PRESS



The Manhasset Press symbolizes the ultimate in advance planning, to serve both present and future needs. Foresight is demonstrated by the construction of the Standard Manhasset 2-color Press on frame which provides for either a third color station or a reverse printer. Ingeniously designed by our engineering staff, these stations can be readily incorporated on this same press frame to print, tint or coat on the reverse side of the web. Thus, Manhasset's foresight makes possible, and available, these *plus* advantages, at comparatively low cost. Any owner of a Standard Manhasset Flexographic Press need only specify—to receive prompt, efficient, installation. Optional equipment with these various types of presses include chill rolls, perforators and slitters. Bag making machines and rewinders are included in the complete line of paper converting machinery supplied by Manhasset Machine Co. All have the same meticulous care in design, engineering and excellence of manufacture. Call or write us for details on special features of our equipment which can be tailored to specific needs.

MANHASSET MACHINE COMPANY

409 Bayview Avenue, Amityville, New York \ INC.

FACTS...FIGURES... SPECIFICATIONS...

on what's new in packaging

FREE!

■ To further help you and your staff "get the facts" on what's new in packaging, each month MODERN PACKAGING publishes the Manufacturers' Literature Page. Check it over. You'll find many brief reviews of the latest booklets, brochures, and bulletins available free from manufacturers. They're chock full of details on services, equipment, materials, etc. that may prove helpful to you.

If you'll turn to page 713 in this MODERN PACKAGING ENCYCLOPEDIA '62 you'll see there are over 400 reviews listed, covering virtually every phase of packaging.

Manufacturers' Literature pages are always easy to find—they're printed on heavy paper. The booklets are easy to order too, with the attached postpaid order form.

Another Service of

MODERN PACKAGING

A Breskin Publication

770 Lexington Avenue, New York 21, N.Y.



Birds Eye Green Peas . . . best known waxed paper overwrap in the frozen food field . . . is produced in four colors by four different printers . . . from Intaglio cylinders.

Duplicate cylinders —for 4 different printers!

The familiar Birds Eye Green Peas waxed paper overwrap is printed in gravure by four printers, from duplicate sets of cylinders engraved in New York by Intaglio Service.

The biggest packer in the frozen food field is assured of uniform wrappers from different printing plants by using Intaglio cylinders. And gets as many as 81,000,000 Birds Eye wrappers from a single set.

Intaglio, specialist in fine gravure for packaging, has developed craft techniques which help your wrapper or label to stand out at the point of sale . . . make friends and customers for your product.

Intaglio cylinders are precision-etched by skilled craftsmen for best reproduction on paper, board, vinyl, cellophane, foil or other materials. And have a longer life, produce more impressions, than electros.

Intaglio is easy to use. We start with the original art, layout, text proofs—and deliver cylinders in as many sizes as required. And supply high-fidelity proofs for the guidance of the printer.

For better packages, and better sales, many leading mass product manufacturers have turned to gravure—and Intaglio.

WITH more than 500 skilled personnel (35% on Intaglio's staff ten years or longer) . . . four conveniently located modern plants to facilitate service in New York, Chicago, Detroit and Cincinnati. Intaglio merits your choice for the best in packaging or publication gravure.

Our seven offices are at your service. Call us today!

Intaglio SERVICE CORP.

Intaglio Service CORPORATION

America's First Gravure Servicers

305 East 46th St., New York—731 Plymouth Court, Chicago—40 Hague Ave., Detroit—1828 Lewis Tower Bldg., Philadelphia—126 West McMicken Ave., Cincinnati—1932 Hyperion Ave., Los Angeles—544 Market St., San Francisco



design

with



CLAREMONT *Flock*.

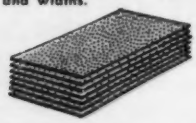


FOR EYE-ARRESTING
GIFT PACKAGES, DISPLAYS
AND PRODUCTS



Claremont Flock-Affixed Papers — in Rolls

For these, in brilliant colors and embossed effects, we direct you to paper mills and paper merchants who process and sell Claremont Flocked papers. Available in rolls of various lengths and widths.



Claremont Flock-Affixed Boxboard — in Sheets

For complete details, samples and prices of boxboard surfaced with Claremont Flock (in colors) — see your paper merchant. Sparkling selections available.

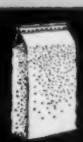


CLAREMONT FLOCK ennobles boxboards and paper with the regal texture and luxury nap of suede, velour and velvet.

The Packaging Industry's Magic Carpet!

—Claremont Flock . . those tiny clipped-lengths of luxurious cotton and regal rayon. We market this irresistible outer raiment in bulk to paper processors, product manufacturers, packaging specialists and display builders who, for dramatic enrichment, apply it to paper, glass, metal, cork, plaster and similar materials.

Flock is a fascinating stimulant—and for pennies, an ounce adds a pound of allure. Check your suppliers—or, for complete information, feel free to contact us direct.



Claremont Flock - Bulk in Dust-Tight Bags

We manufacture and supply Claremont Flock for all display and packaging purposes. Available in 50-lb. sealed-bag units. 18 colors.

Natural and QUALITY CLAREMONT FLOCK *Synthetic Fibers*

CLAREMONT FLOCK CORPORATION

The Country's Largest Manufacturer of FLOCK

CLAREMONT, NEW HAMPSHIRE

CREATING THE IMPULSE TO BUY

FOR AMERICA'S SALES LEADERS!



BLISTER PACKAGING by Jackmeyer

Whether it's soft goods, hard goods or precision instruments . . . a sparkling blister pack by Jackmeyer will protect and 'showcase' your product at its self-selling-best. Over 42 years of production experience and diversified modern facilities give Jackmeyer the technical know-how and creative skill to make your product a *standout* at point of sale.

YOUR ONE COMPLETE SOURCE

Unique in the field Jackmeyer offers a complete service from package development, creative design, printing, blister forming to contract packaging. Every step is quality controlled under one management for maximum efficiency at minimum cost.

For the newest ideas in blister pack design and production, write us—no obligation.

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253 West 26th Street New York 1, N. Y. WAtkins 4-0265
BRANCHES IN PRINCIPAL CITIES



FREE! JACKMEYER'S NEW FACT BOOK

24 pages of fact-filled valuable information about thermoforming and blister packaging. *Write for your copy* on your letterhead.

FINE COLOR AND SPECIALTY PRINTING SINCE 1918 • TAGS AND LABELS OF ALL KINDS IN ALL MATERIALS FOR EVERY PRODUCT.

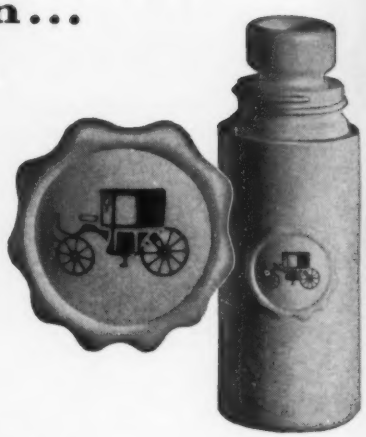
For the striking first impression...

GLITTER FOIL®

Simulated Gold



Adds a new dimension in packaging beauty



Preferred for marking and decorating on papers, films, plastics, cloth and leather.

GLITTERFOIL *compels buyer attention,* adds proven dollar value, gives products a real competitive edge.

GLITTERFOIL *releases cleanly* in mass-production runs. Fine lines come out sharp and clear, panel stampings are smooth and uniform. Wiping or makeready adjustments are minimized.

GLITTERFOIL *retains color stability,* resists corrosion by light, heat, inks and most chemicals.

GLITTERFOIL *is consistent* in shipment after shipment, month after month.

GLITTERFOIL *costs no more than ordinary simulated gold products.*

Send for free samples of GLITTERFOIL to hot stamp on your product. Compare it with other golds. Compare it with other decorating processes.

We think you'll agree, GLITTERFOIL adds the finishing touch to that all-important first impression.

And Now . . . for Polypropylene
GLITTER GOLD
A New Genuine Gold Formulation
Send for samples

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Established 1887

TEN LOVE LANE • HARTFORD, CONN.

NEW YORK • CHICAGO • ST. LOUIS • LOS ANGELES • COLUMBUS, O. • MONTREAL • BRUSSELS, BELGIUM



A MAJOR NEW DEVELOPMENT IN PACKAGING PRODUCTION.
NOW USED BY LEADING PACKAGING FIRMS.

AUTOMATED STEP AND REPEAT with pinpoint precision on the new

ROYAL ZENITH MISOMEX

Fully automatic operation eliminates human error, saves operator time. Accuracy to .001", perfect contact and register. Speeds to 350 steps/hour with film, 70 steps/hour with plates. Incandescent and high-intensity Xenon light.

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NEW YORK CHICAGO LOS ANGELES



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PUNCH CARD MODEL
50" x 72", 80" x 102"



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DAY-GLO®

Switzer Brothers, Inc.
4732 St. Clair Avenue - Cleveland 3, Ohio

manufacturers of DAY-GLO printing inks for gravure, letterpress, lithography, silk screen. Crocker Day-Glo Coated Papers also available.

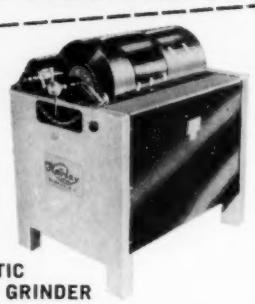
Sales Offices: New York, Chicago, Los Angeles. Canada: A. R. Monteith, Limited, Toronto

Printed in U.S.A.

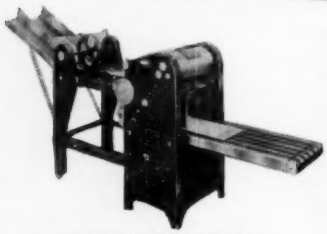
Oxydol is a registered trademark of The Procter & Gamble Company

LOOK TO Harley FOR PERFECT RESULTS

Assures uniform thickness in the complete form. Operation is fully automatic. Simply set dial on ROTOMATIC GRINDER . . . mount plates on cylinder . . . press button . . . and walk away. When plates are ground to required thickness the Grinder shuts off automatically. Available in 3 sizes to fit your needs.



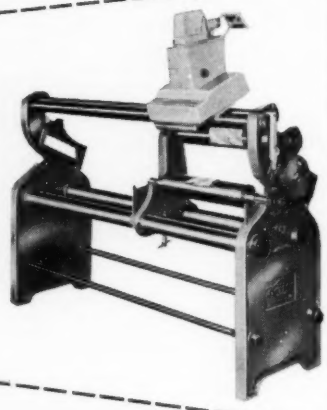
ROTOMATIC
RUBBER PLATE GRINDER



A low cost press to speed up printing. Fast-drying flexographic inks eliminate offset . . . kiss-impression rubber printing plates cut down makeready time . . . simple adjustment means rapid change overs. Result: exceptional savings in time . . . labor . . . and money. Available hand fed or automatic.

FLEXMASTER PRESS

For perfect pre-registration of rubber printing plates. With the patented optical viewer, the operator sees registration of the plates as they are mounted. Easy to operate . . . simple to adjust . . . and assures guaranteed accurate results. For all types of rotary presses.



OPTI-CHECK
MODEL R



A new method for cleaning all types of printing plates with no muss . . . no fuss . . . no dirty hands. It's a small, compact unit that can easily be moved from place to place. Pumps exact amount of cleaning fluid from a specially designed agitator that cleans the plate thoroughly and then vacuums all waste materials into a separate compartment.

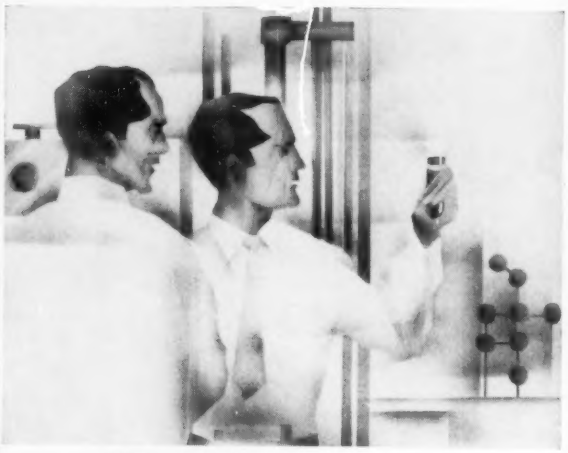
VACUUM PLATE CLEANER

Write for Complete Literature

E. L. Harley INC.
8701 Third Ave. Brooklyn 9, N. Y.
SHore Road 8-7405

porter & dugas

Where Research and Engineering are Producing Better Rubber Printing Plates for the Packaging Industry.



p&d Famous Firsts

MINUTE MOUNTS
Most advanced plate for all types of rotary printing. All components permanently vulcanized in perfect register on a curved base.

MOUNTING BANDS and TENSIONING TOOL
Quick, convenient, foolproof method of holding Minute Mount plates on cylinder.

SNAP-ON BASE
Fastest, most accurate method to preserve registration of sticky back plates for reruns. Instantly on-off in register without tying up cylinder.

MULTI-UNIT PLATES
Individual plates on base made direct from your present artwork or pattern plates. Saves register time and eliminates the major cost of multi-color, multi-up engravings.

COMBINATION RUBBER PLATES
Combines two or more rubber durometer hardnessess, light type and tone work can be printed cleaner without squeezing.

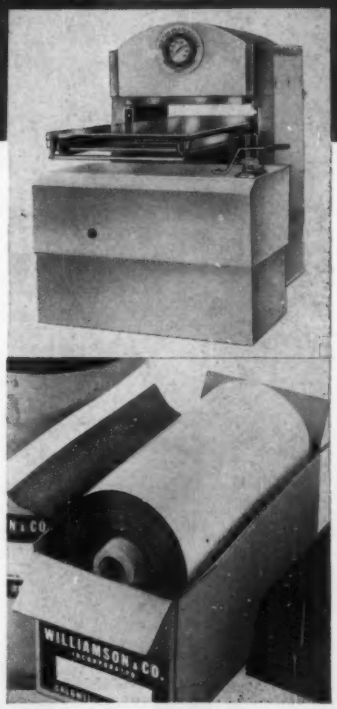
MODULUS CONTROL
All P&D plates are modulus controlled providing extremely fast recovery with lowest degree of permanent set. The result is better coverage, clearer printing and wider ink viscosity ranges at all press speeds.

DOWLOK, newest P & D "first" . . . an integrated art-engineering-and mounting system. Permits plate changes for 2 colors in 3 to 5 minutes. Opens a new era in producing printing and die-cut hardboard cartons.

PRINTING PLATES

PORTER & DUGAS, INC.
626 South Clark St. · CHICAGO
HA 7-5774
IN LONDON: ADVANCE FLEXOGRAPHIC PLATES LTD.
11 Bowling Green Lane, London, EC1, England





WILLIAMSON QUALITY SCORES HIGHEST IN MAKING FLEXOGRAPHIC PLATES and BOX DIES

On target every shot! In fact, the unquestionable leader of the field for over 15 years. For only Williamson gives you equipment of such uncanny accuracy . . . material formulated with such perfection . . . and the most expert technical service. Yes, only Williamson gives you the highest standards of excellence for all three! Why settle for less? Take advantage of Williamson performability and expert-ability when you aim for quality! Contact your Williamson Sales Service Specialist.

WILLIAMSON & COMPANY INC.

Caldwell, New Jersey

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Specify CONSOLIDATED ENGRAVERS . . . none finer

- Complete facilities for textile, machine, and rotogravure engravings.
- Latest equipment and most skilled craftsmen available for consistent quality engravings.
- Continuing research and development on new, improved techniques and processes.
- Our entire grinding, engraving, copper and hard chrome plating process done under one roof.
- Fastest delivery in the roll engraving industry.

We have been engraving rollers of all types for over a quarter of a century and invite your request for further information, quotations and a sales engineer's visit.

APPLICATOR ROLLERS
EMBOSSING ROLLERS
ROTOGRAVURE CYLINDERS
TEXTILE PRINTING ROLLERS



CONSOLIDATED ENGRAVERS
DIVISION OF AMERICAN-MARIETTA COMPANY
311 East 12th Street
Charlotte, North Carolina

Advertisers' Index By Subject Matter

LABELS, SEALS, TAGS

Listings do not necessarily cover entire lines of advertisers or all producers in each category. See also the listing in the Buyers' Directory under the category for which information is sought, especially listings marked with bullets. Also consult Advertisers' Index, last page of the Encyclopedia.

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SECTION 16

LABELS, SEALS, TAGS

LABELING THE PACKAGE

The modern era of labeling dates from the turn of the present century, and came about as a result of trends to self service. Even more significant is the fact that modern labeling is making self service a practical success.

Webster defines a label as "A slip of paper, cloth, leather, metal, etc., affixed to anything and indicating the contents, ownership, destination, rating, etc." The Federal Food, Drug & Cosmetic Act states, "The term 'label' means a display of written, printed or graphic matter upon the immediate container of any article; and a requirement made by or under authority of this Act that any word, statement, or other information appear on the label shall not be considered to be complied with unless such word, statement, or other information also appears on the outside container or wrapper if any there be, of the retail package of such article, or is easily legible through the outside container or wrapper." This Federal Act also states that "labeling" means all labels and other written, printed or graphic matter (1) upon any article or any of its containers or wrappers, or (2) accompanying such article.

Additional Federal labeling regulations have been passed. One is the Textile Fibre Products Identification Act. Another requires a clear warning on labels for hazardous substances, and specifically mentioned are toxic, corrosive and flammable chemicals, irritants and strong sensitizers, and substances capable of generating pressure by decomposition. First-aid instructions also are required. Both acts are intended to meet problems arising from the introduction of new materials and modern trends to self-selection and do-it-yourself—requiring more protection for consumers. (See article on p. 32.)

Labels today are produced by the basic printing processes: letterpress, offset lithography, gravure and flexography. Screen process, decal, stamping or another of the graphic-arts methods may be involved. (See articles and chart on printing in Section 15.)

The kind of container and its conditions of marketing and use govern, to

COLOR-CODED printed foil labels used to identify different dressings in similar jars. Colors in screw-off closures duplicate coding of labels. *(Continental Can photo)*



TRADITIONAL image of French wine characterizes body and neck labels and wrapper. Neck label identifies wine type. Wrap designed for American market adds to quality look. *(National Distillers photo)*



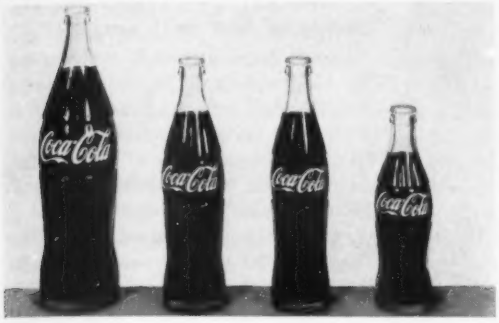
NEW label reflects tradition. Green, gold, buff, brown used in neckwrap and label. Fine script. *(Linfield Distillers photo)*



LABEL EVOLUTION reflects range of merchandising changes. Modern label, right, achieves both force and ethical appearance. *(Crown Cork & Seal photo)*



PACKAGE SHAPE, long familiar to the public, serves the function of a label. The bottle is a legally-registered trademark of the company.



a large extent, the type of label required. This article is mainly concerned with applied labels or those that are printed paper, films or foil designed for application by adhesives or heat sealing to a container or to the product. Many containers or products, however, employ integral labeling, wherein the imprint is applied directly to the surface of the container or product. The lithographed coffee can, the screen-printed milk bottle and roll-leaf-stamped plastic containers are examples. (See articles on decorating containers—plastic, p. 285 and glass, p. 363.)

Can labels

Labels for cans usually are wraparound labels. The majority of these is made of paper because of its superior reproduction characteristics, its flexibility and its adaptability. This is a specially made paper with a hard, smooth finish on one side and a semi-absorbent back to aid in permitting adhesion to the can. The length of the can label exceeds the circumference of the can by ⅜ to ½ in. to provide for a glue lap. This lap, along with spots of glue placed between the label and the can, hold the label securely. The bead of the can, which extends out over the top and bottom of the can, keeps the label from absorbing too much friction and lateral movement. On certain products, such as condensed and evaporated milk, different types of cans are used which do not have a bead. Labels for these cans must of necessity be manufactured either with scuff-resistant inks or with a coating to resist abrasion and scuffings.

Varnishes and lacquers. To protect the printed surface of the label from abrasion and scuffing and to add moisture and frost resistance, a finish of varnish, lacquer or synthetic coating is applied over the label after printing. Varnish may be applied by special coating machines or by a printing press. Where only some areas of the label are to be varnished, a special printing plate is made which applies spot varnish on the desired area only. The selection of the coating depends on the treatment the label will undergo during its travel from plant to consumer. The type of varnish is determined by the amount of gloss desired. While the use of varnish, lacquers or synthetic coatings is necessary to minimize various wear and environmental influences, these coatings also enhance the appearance of the label. They add a gloss or luster which highlights and emphasizes the color and vignettes or pictorials.

Embossing. The raising of part of the label design gives a sensation of depth or a three-dimensional effect. Embossing is used to enhance attention-getting values and is especially important for achieving certain luxury or "atmosphere" effects.

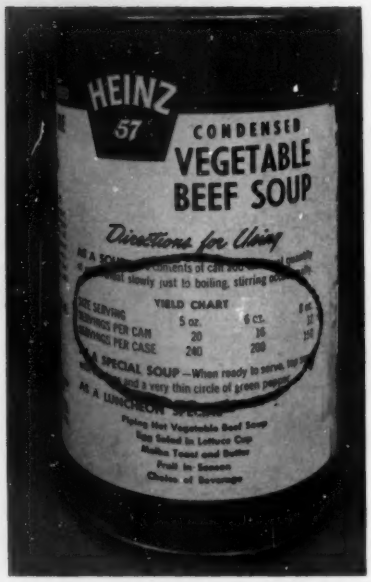
Glass containers

Labels for glass containers either are wraparound bands or are spot labels. Glass offers the opportunity for the customer to see the contents of the container. This often eliminates the necessity of including a vignette or picture of the product in the design of the label. The wraparound band usually occupies the middle half of the vertical surface of the container, leaving a natural display area above and below the label.

The adhesive used to affix the label to the glass container is critical because of the smoothness and the lack of porosity of the glass surface. Silicone-treated glass jars and bottles present an even more difficult adhesion problem. The silicone treatment imparts a strong water repellency to the glass surface and regular glass adhesives are rendered ineffective. Special adhesives made for silicone-treated glass are required. The wraparound label overcomes some of this difficulty because, like the can label, it, too, has an overlap, called the glue lap, which helps anchor it.

Spot labels. This type of label is used on both glass jars and bottles. Such food products as mayonnaise and salad dressings, jams and jellies, peanut butter as well as cosmetics, make wide use of spot labels of various sizes. Also, most beverage labels, both alcoholic and nonalcoholic, are spot labels. The choice of paper is very important for the labeling of glass-packed products. The difficulty of adhesion requires different types of paper or additional steps in the manufacture of labels for use on glass, as compared with tin. The selection of the grain of the paper is frequently critical because, if the paper runs the wrong way, the label will spring away from the curvature. If paper stock is too heavy or dense, similar difficulties may be encountered. To overcome this, spot labels can be pebble embossed to break the fibre of the paper and at the same time enhance the appearance of the labels.

Beer labels use a lightweight, water-



WORKING LABEL charting number of servings—in three sizes, per can and per case—contributes to portion control and menu diversity.



SEALED FOLDER slipped over bottle neck and held by cap is attention-getter in store. Contains recipes and use suggestions. *(Eureka Specialty Printing Co. photo)*

resistant paper and a special adhesive which speeds up the cleaning of returnable bottles. The paper is made to withstand water, but at the same time, when put in a cleaning solution, it disintegrates rapidly. Many labels for beer bottles employ a foil-paper lamination, because the foil resists water penetration and also because foil has excellent sales appeal.

Die cutting. Die-cut labels are made in many different shapes and sizes, depending on the effect desired and the limitations of the container. The printed and graphic material of the die-cut spot label is designed to match or to complement the shape of the finished die-cut.

Direct labels on glass. Direct or integral labels are used on certain types of bottles. For the soft-drink industry where bottles are returned for re-use, labels may be molded directly onto the bottle—etched or sandblasted. In some cases the screen process is used to impart a semi-permanent label to the bottle. Some such "labels" last the life of the bottle; others for numerous returns.

In the case of distilled spirits, combination labeling may be used. The quantity of contents may be molded, etched or sandblasted into the bottle. When this is done, it is not necessary to place the contents statement on the label. The paper label then contains the balance of the label information.

Labels for bottles and jars which do not have recessed areas for either the wraparound or the spot labels are particularly subject to abrasion and scuffing in transit. Highly scuff-resistant varnishes and lacquers are necessary to protect the labels. In the last few years more of the glass containers have been providing this recessed area to help overcome scuffing caused by the rubbing of the container against the dividers in shipping cases.

Frozen-food labels

Labels for frozen foods usually are of the wraparound type or the overwrap type, printed in full color, with a large vignette or picture of the contents. Like other food labels, the emphasis is one of appetite appeal.

On one type of container, the label wraps around and is attached to a wax-impregnated fibreboard body. The ends of the container are tinplate which crimps around the ends of the fibreboard. The paper for these labels must be a coated type of good grade. Furthermore, the labels should be carefully varnished or lacquered to provide needed moisture resistance.

Wraps. The selling message for many products is printed directly on the wrap or bag. Bakery goods, cereals, candy, bar soap and many other products employ packages where this method of labeling is employed.

Certain wrapped products—bread is a good example—use an end label or band label in addition to the printed or transparent wrap. Bags, particularly those used for cookies or produce, frequently employ a header, collar or saddle-type label.

Adhesion and heat seal

Some paper is coated with an adhesive on one side. It is then printed and finished into a label. This adhesive is of several varieties. One type requires water as a solvent; others require heat as an activating agent. Some adhere immediately upon heating; others have a delayed action. The heat-seal labels are used on many products; spot labels are used on bakery products and a wide variety of pre-packaged products as a combination label and sealing edge, because various kinds of adhesives are available which will adhere to a wide variety of substances.

Decalcomania transfers are used on glass, plastic, metal, wood or any container with a relatively smooth surface. The background of the decalcomania can be either opaque or translucent, depending on the color of the container and the basic design. All necessary and required labeling information can be included on the decal and a wide choice of colors is available. On plastic or glass containers, transparent decals seem to be part of the package.

Labels for drugs

According to the Federal Food, Drug & Cosmetic Act, the labels for some drugs must contain the statement, "Caution, Federal Law prohibits its dispensing without prescription." Drugs of this type, because of harmful potentialities, are to be used only under the supervision of a licensed practitioner and must be sold only by prescription. The labels of all other drugs must include a statement of the active ingredients and adequate directions for use. Among other requirements, these labels must include adequate warnings against misuse, such as by children, and unsafe dosage.

By long commercial practice, this second group is divided into two categories: (1) those which, while adequately labeled, are advertised only to members of the medical profession and usually are sold on a prescription and (2) those products that are advertised and promoted directly to the consumer for use in home medication.

The labels for small-size prescrip-

tion bottles, jars or tubes are, in many instances, glued very lightly and can be easily removed by the druggist so he may attach his prescription label directly to the container. To facilitate this removal, the paper for this label is the lightweight, soft-bodied type. On larger containers from which the pharmacist will remove drugs for compounding prescriptions, the label is made of heavier paper stock and firmly attached to containers.

Miscellaneous labels

Use labels have become a part of many miscellaneous products. These labels describe methods of using appliances, hardware, utensils, electric equipment and do-it-yourself tools and materials. Such labels sometimes carry product warranties and information as to the materials included in the manufacture of the product and the location of service facilities.

Stock labels, intended for use by more than one packager, are labels on which the basic design has been preprinted, with blank spaces left for imprinting the necessary individualized label information. These labels are made up in a wide variety of shapes and sizes to fit all possible uses. Stock labels are available for food products, beverages and many other commodities. Expert design and excellent quality can be obtained, because many small users are, in effect, pooling their orders and underwriting the cost of a label superior to what they might afford singly.



ALUMINUM labels, with special adhesive giving strong, permanent bond, are not affected by extreme heat or cold. Resist peeling, cracking, chipping. Designs anodized into 0.003-in. foil. *(Ever Ready photo)*

Legal considerations

There are Federal, state or municipal regulations, or a combination, controlling the labeling of commodities moving in commerce locally, nationally or internationally. (See article on legal considerations, p. 32.)

The labeling information necessary to meet these Federal, state or municipal requirements occupies at most only 50% of the label or wrap—in many cases less. This allows the designer and artist great latitude in developing attractive designs with a wide use of color and permits the manufacturer to use adequate space for illustrations, tie-in offers, cross-advertising and premium coupons as well as complete use instructions.

Recent years have brought many new uses of labels into existence. Auto replacement parts, toys, hardware items and even battery acid are now packaged individually by the manufacturer and labeled. Now a customer can buy a commodity, sealed and labeled by the manufacturer, with full confidence that this is the right product and that there can be no possible substitution.

But, as with other phases of our distribution system, labels must be the subject of constant study and review to maintain an element of freshness and newness. Styles and fashions of commodities change periodically to keep pace with the demands of consumers and to create additional demand by consumers. Labels must also change to keep pace with new designs, modern styles.

Glossary of label terms

Back label—Used on back of container.

Band label—Wraps around container or product, does not cover entire surface.

Box wrap—Wrapper applied to top or bottom of a set-up box.

Can label—Used on tin cylindrical containers. Usually wraps around container.

Canister label—Used on a fibre container.

Case or crate label—Used on wooden shipping boxes.

Consumer panel—Label area at back of container devoted to product information.

Cup label—Cup-shaped with one end open. Wrapper that forms the cigarette package is called a "cup."

Die-cut label—Label of irregular shape cut with a die.

Display panel—Label area at front of container which usually includes (1) brand name, (2) trademark, (3) product name and (4) product vignette.

Embossed label—Label on which a portion of the design is raised.

End label—Essentially a spot label applied to end of box or wrapped package.

Face label—Spot label used on the front of a container.

Glue lap—That portion of a label used for gluing.

Halftone—A photographic production of original material or artwork made through a screen to reduce gradations of tone by means of a pattern of dots.

Heat-seal label—Thermoplastic coated label requiring heat to soften coating and permit application. When coating cools, tight bond results.

Insert label—Used on the inside of transparent packages such as bags.

Lacquering—Similar to varnishing, using different coating material. Used to give a special quality to label, such as alcohol resistance.

Line cut—Printing plate made from artwork or type proof consisting of solid lines or masses without any tone gradations.

Machine varnishing—Special machine coats the entire sheet after it is printed.

Mandatory information—Product information required by law to appear in prominent spot on label.

Neck label—Used for neck of bottle.

Over-all wrap—Covers the entire surface of a container, top, bottom and sides.

Press varnishing—Varnishing label on a press after the printing operation by means of a press form which applies the varnish as it would ink.

Rider label—Used on textiles, folding over the edge of the merchandise.

Saddle label—Folds over neck of bag like a saddle; usually acts as closure. Useful with transparent bags to provide brand name, price spot, etc. When perforated, permits display from a hook.

Seal—Special-purpose label produced by dies that print, emboss and die cut in a continuous series of operations.

Spot label—Label which covers only a portion of the container.

Stock label—"Stock design" label; individual brand name or product identification can be imprinted.

Strip label—Same as band label.

Tab label—Label which fits over the top edges of a bag or sack.

Tag—Special-purpose label, affixed to product or container by string, wire, etc.

Thermoplastic label—(See heat-seal label).

Tight wrap—Over-all wrapper sealed tightly around a folding-box shell.

Top label—Die-cut circular label adhered to top of can.

Vignette—Any picture, as an engraving, photograph or the like, which shades off gradually into the surrounding ground of the unprinted paper, used in the design of a label to indicate contents of package.

Wraparound label—Fits all around container; does not cover top or bottom.

SEALS AND TAGS

by A. L. Hayes, Jr.*

Increasingly important jobs in today's merchandising are entrusted to seals and tags. Selecting a proper seal or tag deserves careful study and it is a wise precaution to enlist the services of a reputable seal or tag manufacturer whose experience can be of invaluable assistance.

Seals (as distinguished from labels) are the product of so-called "french edge" seal presses, which print one or more colors. emboss and die cut in a single operation. Characteristic of this process is the narrow embossed border of the base material, the "french edge" from which the process name is derived. These seals have the printed copy sunk in, or debossed; the stock showing through reverse copy is raised, or embossed. In production, since all inks are wet, the printing of one color over another is not always feasible. Therefore, a thorough knowledge of machine capabilities and limitations is essential to the preparation of seal designs. Virtually any shape can be produced and in a variety of sizes.

Embossed seals have been used on widely diversified products and are frequently created to serve by themselves as a publicity medium. Seals can become real "shopper-stoppers" applied to bottles and jars of food products, textiles, hosiery, sporting goods, glassware and similar products often sold in supermarkets or "mill outlets." In this type of merchandising, where competing brands are mass displayed side by side, they are especially effective in providing the colorful eye-catcher needed to attract the customer. When used as a decoration or brand identification on perfume and other toilet goods, whiskey decanters, giftwares, confectionery packages and the like, an embossed, metallic foil seal is ideally suited for presenting an appearance of richness.

In the category of seals are numerous items not generally thought of as such. Tuck-in or stand-up price markers for watches, jewelry, silverware, pens and pencils often are technically seals. So are tip-ons and decorations for greeting cards, riders for neckties, bendovers for ribbons and many others. The versatility of this process often is limited only by the ingenuity of the designer, who has a vast array of materials and techniques.

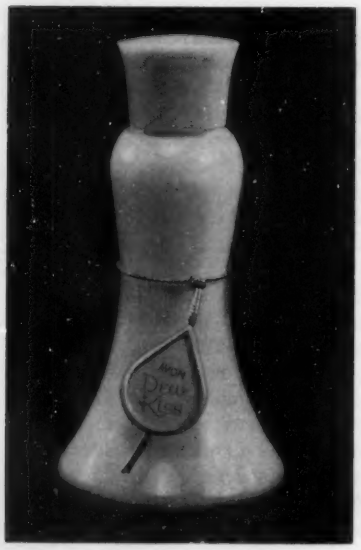
Designing of seals is a highly specialized craft and requires a thorough technical knowledge of the process. In addition, a good designer must know about merchandising methods and problems of application to all types of containers and products. He should be furnished with complete details as to copy, general size and shape desired, color preference if any, method of attachment to be used, whether hand or machine applied, manner in which product is to be marketed and specific results desired of the seal. This will enable him to offer the most practical, attractive and effective suggestions.

Materials and adhesives are available in wide variety. Their selection will be governed largely by the effect sought and mechanical requirements of the usage. Aluminum foils are the most popular stock and may be had in a range from lightweight for use in labeling machines to heavy gauges

*Sales Manager, The Foxon Co., Providence, R.I.



DIE-CUT, EMBOSSED seals with distinctive printing give look of luxury to a variety of products. *(Foxon photo)*



HANG-TAG seal identifies this foundation base yet has a non-commercial look—and the pale pink cream is completely visible through the clear glass. This type of tag is three-dimensional, can be designed in sizes and shapes to suit any type product, and be made in plastic or metal. They provide prestige appeal at the point of purchase. *(Stoffel Seals photo)*



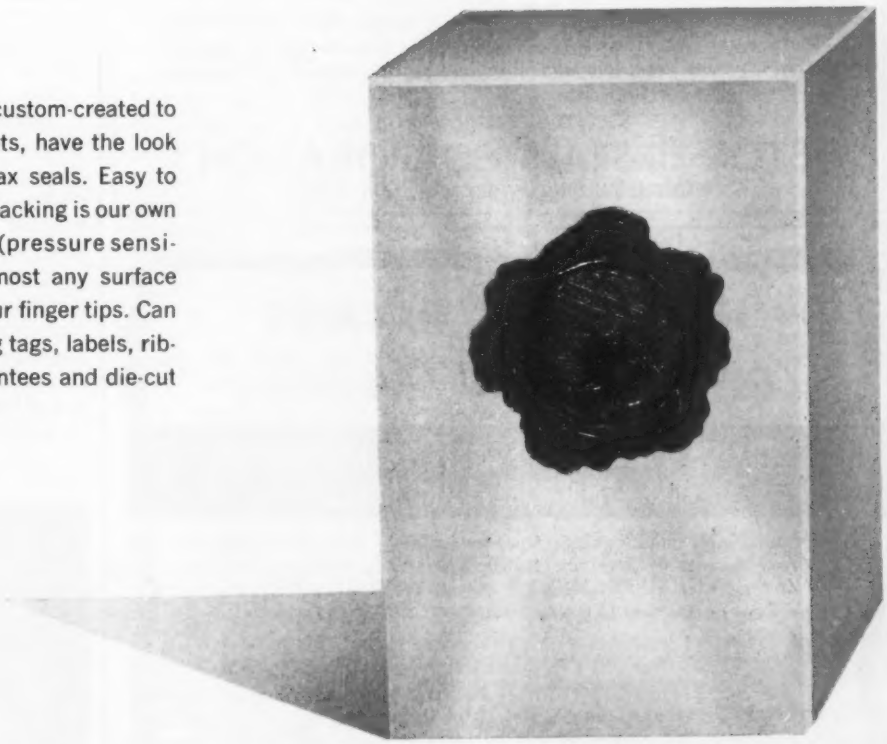
ELABORATE, multicolor effects achieved with seals and tags impart distinction to products that they identify. *(Cameo photo)*

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permitting maximum embossing or rigidity. In addition, there are a number of paper stocks, both white and colored, obtainable in various weights. Adhesives suitable for almost any purpose may be selected. Seals can be furnished without adhesive for machine application, or with water-moistened gumming suitable for adherence to many surfaces such as glass, paper, cloth and wood. Special formulas may be needed for more difficult surfaces—certain plastics, metals and lacquer or varnish finishes. Heat-seal or thermoplastic compounds of either the instant-action or delayed-action type have been perfected so that foil seals of this type as well as paper are now practical and in wide use. Pressure-sensitive seals have come into wide usage in recent years. Furnished individually die-cut or in rolls, they can be supplied with adhesives designed for many difficult applications. They can be made for permanent adhesion or to be removable, as desired.

Tags. The term "tag" is used loosely to describe many types of marking devices, but generally is applied to those whose attachment is accomplished by some means other than adhesive. These include strings, ribbons, wire, and various slots, slits and holes. Most tags are the products of several printing processes, such as seal press, letterpress, lithography and special tag machines. Often the physical shape of the product or package makes a tag the only practical means of marking the product. Too, these



TAG SIMULTANEOUSLY imprinted and pinned to garment. Semi-automatic machine enables legally required fibre-content data to be provided without increase in costs. Type changes available. *(Dennison photo)*



MINIATURE TAG, on elastic string, represents familiar carton of former packaging—to retain product image in promotion of new bottle and label now marketed without a carton. *(Normandie Press photo)*

products often require considerable descriptive matter or direction copy and thus a tag booklet is indicated. Frequently seals and tags are used together to give the most effective point-of-sale impact.

Marketing has changed greatly in the past decade and, with the introduction of thousands of new products and materials to the retail counter, obviously it is impossible for salespeople to know all about each of them. The rapidly increasing use of self-selection selling for all types of merchandise places the burden of the sale squarely on the package itself. Widely recognized is the fact that informative marking is a "must" today and tags are ideally suited to perform this function. The buyer of an electric appliance wants to know what it will do, how to use it, whether it is backed by a guarantee and the manufacturer's name. In shopping for clothing or other textile products, the customer is interested in the fibre content, whether the colors are fast, if the garment is washable or must be dry cleaned and instructions for care. These are typical of the facts demanded by shoppers which should be provided with the product. A tag carefully designed for the particular use and thoughtfully prepared as to copy and appearance can be the deciding factor in making the sale.

Style of the tag selected will depend on several factors, not the least of which is the most practical method of attachment to the article. A pair of slacks, a blouse or jacket might use a tag with a slot to go over buttons. Fishing-rod or luggage manufacturers would probably prefer a string tag; on jewelry and perfumes, ribbon tags of metal foil imply luxury and quality. Products subjected to rough handling probably require a tag reinforced with paper or metal around the hole and fastened with wire. Specially designed die cutting permits soft goods, such as underwear and lingerie, to affix the tag by pulling a small pinch of the material through a slit. Various shapes may be devised to lock around a projection, a handle or a strap on some products.

Appearance of the tag is of paramount importance on products sold at retail. It should be pleasing to the eye, uncluttered with needless copy and design, but still contain the wanted information. Sometimes a folded tag will allow the inclusion of considerable type matter without detracting from the attractive look of the outside cover. While cost is naturally a factor, nevertheless it definitely should be secondary in deciding on what to use because a poorly made tag is almost worse than none at all.

Paper and foil are the most common tag materials but others such as plastics, metals, simulated leathers and textiles and the like are available to achieve the desired merchandising effect. Familiarity with the wide range of materials and surface appearances is essential in determining the best possible tag for a specific end result. Some will require a strong tough stock to resist tearing or wrinkling in handling, and others a stock that will fold without cracking. If a portion of the tag is to be torn off at perforations, the material must be suitable for this. In striving for special printed effects, certain materials give better results than others. If a tag is to be embossed, consideration must be given to the printing on the opposite side, what this will do to the embossing and vice versa.

The growth of the use of foil in all forms of packaging has inevitably spread into the tag field. More tags are using metallic foils than ever before and it has proved to be an excellent means of enhancing the prestige appearance of a product. Glittering and reflecting light as it dangles from an article, it not only catches the eye but also demands closer attention.

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The efficient pressure-sensitive label

by John S. Torrey*

Versatility, speed of application and reliable adherence are three of the major attributes of pressure-sensitive labels—one of the fastest-growing developments in packaging.

Since their innovation in 1935, countless numbers of packaging applications have been found, for eliminated are the need for glue pots, conventional moistening and various types of chemical, solvent or heat activation to make the label stick.

Pressure-sensitive labels actually changed merchandising concepts, gave a new approach to packaging and contributed to production efficiencies in all types of businesses. They meet the need created by modern production methods for a faster, more dependable and efficient labeling system. Uses include: identification, assembly marking, instructions, sales promotion on packages, price marking, carton contests, service labels, product or service guarantees and many other uses.

Pressure-sensitive labels do not, of course, supersede many traditional and well established types of labels, but they do offer many advantages needed for modern packaging line operations, newer trends in merchandising and consumer demands for more attractive and efficient labeling. In this connection, pressure-sensitive labels excel in the labeling of delicate or difficult surfaces, fragile items and products such as instruments or gifts, where easy removal is desired. They have important uses as a supplement to packages already labeled or decorated.

A pressure-sensitive label is one that adheres to a surface by simple press-on contact. It consists of a selected base stock—paper, film, foil or textile—printed on one side and coated on the other with a tacky adhesive. Backing paper, applied on the adhesive side of the label, protects the pressure-sensitive adhesive from contamination, serves as a carrier for dispensing and prevents labels from sticking together before use.

Numerous pressure-sensitive adhesives based on latex formulations are possible, but all can be classified into two types: removable and permanent. The removable pressure-sensitive label was the first label specifically designed for easy removal from a package without leaving a mark or stain.

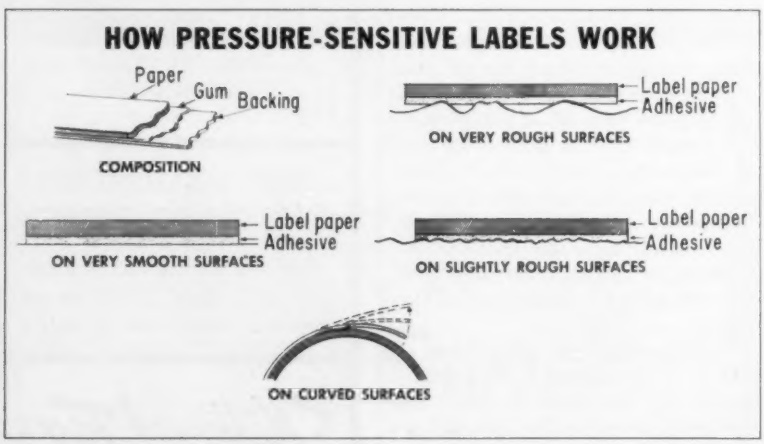
Label construction makes use of three basic forms, each suited to a particular need. These are:

1. *Laid-on labels,* precisely positioned on backing paper with 1/16 in. space between each label. They are available in sheets or rolls. The latter are especially suited to high-speed manual or machine operation, because the rolls lend themselves to fast dispensing of the labels.

2. *Split-back labels.* These labels are individually die-cut; backing paper is split to facilitate removing in two pieces. This type is recommended for large labels and situations where small quantities will be used by numerous personnel. Examples include display signs and similar applications.

3. *Slit-type labels,* butted next to each other; yet separated by a fine rule cut. They are usually packaged in rolls, but sheets and single labels also are available.

*Vice President and General Manager, Avery Label Co., Monrovia, Calif.



Composition. Label material is coated on one side with adhesive; mounted with backing paper. Other side may be printed.

Very smooth surface. Adhesive makes total contact—ideal labeling condition.

Very rough surface. Adhesive contacts only peaks—reducing the effectiveness.

Slightly rough surface, such as anodized aluminum, gives superior contact.

Curved surface. Label tends to snap back. Stronger adhesive, special materials or design can overcome problem.

Surface considerations

Almost any surface is suitable for pressure-sensitive labeling: plastic, metal, paper, glass, ceramic, rubber, wood, painted, enameled, varnished and lacquered. And the choice of label materials is just as wide, based on the packager's requirements. Materials include paper, foil, fabric, metal, acetate, other plastics and combinations in the form of laminated structures. Transparent labels can be obtained and are effective for many products.

Pressure-sensitive labels stick to many surfaces or materials to which other types of labels will not adhere. For instance, this type of label is ideal for polyethylene and many of the newer plastics where other adhesives may be unsatisfactory. Generally, press-on labels adhere best to reasonably smooth surfaces, where good contact is achieved and labeling conditions are not extreme.

Surface condition is important: the material should be clean and free from all loose particles. If the surface is dirty, chalky or wet, the labels may not adhere well because the adhesive then sticks to the loose material and proper contact with the surface to be labeled is prevented.

Another aspect of surface condition is curvature. Although labeling is best accomplished on flat surfaces, pressure-sensitive labels are being manufactured for various shapes, such

as round containers. Proper adhesives and label design overcome this problem. In labeling a double curve, for instance, selection of a small or long and narrow label—to minimize the "strain effect" and give additional adhesive tack—may be necessary.

Atmospheric conditions have relatively little effect on pressure-sensitive labels, except where surfaces to be labeled are hygroscopic. At low and freezing temperatures both permanent and removable labels remain firmly affixed. At above 160 deg. F., the removable-type adhesive generally breaks down rapidly. Short-term exposure to heat as high as 300 deg. F. usually has no undesirable effects.

These limitations are not applicable to permanent-type adhesives, and with certain label materials long-term exposure to temperatures as high as 400 deg. F. is practical. No general statement can be made on limitations, but proper choice of material is important for extreme temperatures, since paper chars at 300 deg. F., although formulations are possible to resist heat as high as 500 deg. F.

The extremely high plasticizer content of plastic-coated bottles often results in softening of adhesives, brought about by migration and subsequent penetration through the adhesive by the plasticizer. The consequence is usually a greasy-looking label; also ink smudging and lifting can result. Certain removable adhesives are generally resistant to this type of action, and, in extreme cases, a metallic foil label paper is recommended since the metal acts as a barrier against penetration.

Pressure-sensitive label selection chart

Stock	*Characteristics*	*Removable adhesive*	*Permanent adhesive*
Dull, litho, clay-coated paper—60-lb., 0.0035 in. thick.	High internal split strength. Good printing. Dispenses well with semi-automatic or automatic equipment.	Product, guarantees; special messages; price marking; general use.	All-purpose labeling and package marking.
White gloss paper. Cast-coated, one side—30-lb. paper.	Excellent for printing; light and medium ink coverage. Relatively weak; easily torn. Dispenses, adheres well.	Applications where gloss improves label appearance.	Applications where gloss improves label appearance.
Limp, durable latex impregnated paper.	Light-basis-weight paper. Less absorbent. Good durability, tough. Resists water.	Especially for nonporous surfaces, curved surfaces, plastic bottles, etc.	For flexibility when applied to curved surfaces; rods, tubes, etc.
Heavy duty latex-impregnated paper — 50-lb., 0.0035 in. thick.	High heat resistance, but otherwise same characteristics as above.	Greater toughness than above. Removability in difficult applications.	For gas heaters, any device that heats. Weather resistance.
Cellulose acetate — 0.0015 in. thick.	Minimum shrinkage at high humidity. Transparent. Flexible for curved surfaces. Good printing. One color and background gives two-color impression.	For pens and lipstick cases; point-of-purchase materials; wide variety of other uses.	For mounting cards, documents, photos. Applications requiring surface to show through label.
Paper-foil, lacquered — 47-lb., 0.003 in. thick.	Excellent printing. Good temperature resistance. Impervious to oil, acids, alkalis.	Improved label appearance.	Embossed labels; improved label appearance.
Dull, litho, clay-coated paper—44-lb., 0.0025 in.	Light-weight paper. All-purpose. Forms quickly to odd shapes. Less opacity.	Flexible for curved surfaces.	Pilfer-proofing, sealing.
Base paper with fluorescent coating—60-lb. paper, 0.004 in. thick.	Radiant colors. Good outdoor endurance. High internal split strength. Best with dark contrasting colors. Not best for extreme curves.	Advertising, point-of-purchase and special sale stickers; limited removability of labels.	Outdoor advertising; special promotion labels.
Aluminum	Strength and quality.	None.	Nameplates, dials, calibrations.
Metallic coated paper. Bronze and aluminum powdered paper.	Metallic finish but duller than foil. Good printing. Low split strength. Fair adherence to curved surfaces.	In lieu of foil; marking of parts.	In lieu of foil; marking of parts. Used for cosmetics, lipstick, etc.

Many advantages accrue to the user:

1. Fast, easy application. Speed of manual, semi-automatic or automatic application compares favorably with other labeling methods. Automatic dispensers are available to meet high-speed production line needs, and trouble-free operation, exact placement and 100% effectiveness can be obtained.

2. Economy. There is no waste factor; in many operations, efficiency of application permits lower costs.

3. Consistent adhesion. Labels will not pop off or curl.

4. No activation required. Heat, solvents, water and other forms of activation are eliminated.

5. Minimum adhesive deterioration. Permanent adhesives actually increase their bonds with aging. Non-permanent labels remain easy to remove during intended period and condition of use.

6. Instant sticking. Simple fingertip or moderate mechanical pressure affixes labels.

7. Wide selection of label materials in any size, shape or color.

8. Finest quality printing or embossing—in one, two or three colors by letterpress, gravure, offset, flexography, embossing and other methods.

9. Available in two types: permanent or removable adhesives.

Most packagers have discovered their versatility in emergencies. A change in a regulation, a special promotion or a new advertising message can quickly and economically be added to standard packages.

Price is sometimes mistakenly cited as a deterring factor when considering use of pressure-sensitive labels. A packager must look at the cost of labor as well as the label. Using this formula, he will often discover that the use of pressure-sensitive labels can provide lower over-all costs. In this connection, a wide variety of dispensers to meet every need is offered. For high-speed packaging lines, automatic labeling machines are available to meet production speeds.

A new imprinter-labeler-conveyor, consisting of a labeling head mounted on a stand conveyor system, has been designed to meet a need for complete units that can be integrated into the packaging line. It is a complete imprinting, labeling, product-handling unit capable of processing packages with printed labels at speeds up to 120 per minute.

Price marking methods

Continuously fluctuating prices and competition in merchandising, plus constant innovations in packaging, improvement of product, formulae changes and the like must, of necessity, preclude any general or hard-and-fast rule for pre-pricing. This is particularly true in the food and other retail fields. Aside from these basic economic forces, reaction to the practice of manufacturer pre-pricing is often varied and contradictory. And whether it is a good or bad policy must be decided by the seller upon his analysis of his consumer trade or demands of individual retailers.

Many advantages come to mind when pre-pricing packaged merchandise is primarily considered. The most obvious is labor-time saving in the store or supermarket—with consequent payroll savings. As reported by members of the supermarket industry, marking of items for sales shelves takes 22% of all supermarket manhours, an equivalent of one cent out of every sales dollar, or about two-thirds of the average net profit (1.46%).

Speeding up the refilling of shelf stock is another important sales aid. Ready-marked packages can be replaced easily right from the shipping carton on to the shelf without the time lag necessary for the usual price-marking. Also, with prices clearly stamped or printed on the container, there is no possibility of mismarking and the figures are clear, legible, uniform and in the same place on each package. Clearly "printed" prices eliminate or greatly reduce mistakes at check-out counters or cashiers' desks, another profit factor. They also leave no room for argument with a customer who sometimes tries to interpret a smudged "home-made" stamped price to his own advantage.

When price is incorporated in the package printing plates, or added as an assembly-line applied label or ticket, pre-pricing by the manufacturer should add little or nothing to his costs. Consequently, his price to the retailer for this added service should not be affected.

Consider department stores, where today pre-priced merchandise is more generally accepted. The average in-store marking cost is ⅛₀ths of 1% of total volume, according to the National Retail Merchants Assn. This is a definite plus for pre-pricing when compared to the 1.46% of net profit said to cost supermarkets for in-store price marking.

Apart from the economics governing the question of "to pre-price" or "not to pre-price," pre-pricing offers the psychological advantage of the customer seeking a fixed price marked down to a "bargain" or "special" price. Contrarily, when products are price-marked by the manufacturer, the end-use customer knows the price usually asked for the item and will generally pass up the "un-set" price of an equivalent product which might, offhand, seem higher priced. In other words, brands and prices become associated in the consumer mind.

For the disadvantages of the system of pre-pricing packages, the opposite stance can be taken to many of the "pro" points: Labor-time-cost saving is conceded; also minimizing of confusion and mistakes at check-out counters, etc. However, pre-pricing in other than very stable product markets is a gamble. It can cause "junking" of pre-marked containers if the market calls for a revision in price, upward or downward from the original. Pre-priced items lend confusion, also, when the retailer is offering a "special" and wants to mark the package down. Two different prices marked on the package (the original and the hand-stamped "new" price) can cause mistakes at check-out and tend to mar the original, attractively designed container with ink-blurred markings, extra labels to obliterate sales messages, use instructions, etc.

In "Fair Trade" areas, pre-fixed pricing makes pricing difficult for those retailers who want to give "illegal" discounts. Gift merchandise does not lend itself readily to pre-pricing, unless special methods are employed. Psychologically, a pre-printed price takes away the delusion of the customer that a special, local price, selected by the storekeeper for his customers only, is being quoted. The customer is known to conclude that a "hand-stamped" price is special whereas a neatly pre-printed, incorporated price is "list."

To circumvent some of the objections to pre-pricing packaging, several logical methods have been devised by the manufacturers, either freely or in cooperation with their retailers. Often the retailer is able to stipulate the type desired as well as the price.

Printing the price at the time of printing the sales message, particularly where fair-trade pricing is still effective, is one of the most widely accepted methods of pre-pricing. Illustrative of this are the many packages which prominently display the price as part of the sales display. This method affords the least increase in cost to the manufacturer, being added initially to the sales copy.

Other techniques, which can understandably add to the production expense but which are logical methods of approach include removable price marks in the form of pressure-sensitive pre-printed cost legends. These are applied on the assembly-line at the time of other wrapping operations. This can be done with complete cooperation between manufacturer and purchaser in that each order can have its own predetermined price applied, including local tax breakdown, etc. For gift merchandise this type label is easily removed and makes frequent price changes easy.

Another proved method is the paper neck label which can be placed on one item of a multipack, or can be used at will for individual packages which lend themselves to such a tag. And, of course, the paper or plastic film pre-printed stretchable band which has grown tremendously in sales-merchandising popularity allows for "2-for" or "6-for," etc., specials to be marked easily or "unmarked" by complete removal when the "sale" is off. In many cases, pressure-sensitive perforated labels or tickets are attached to merchandise. These enable the seller to detach the price part of the label or ticket, allowing the remainder to adhere to the package. This permits gift giving and also allows the seller to code the item on that part of the label remaining—helpful in case of returns, etc.

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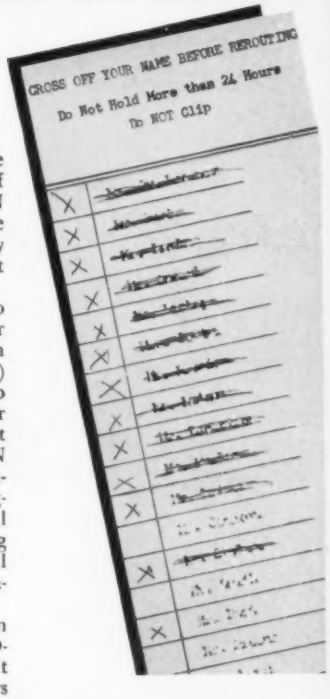
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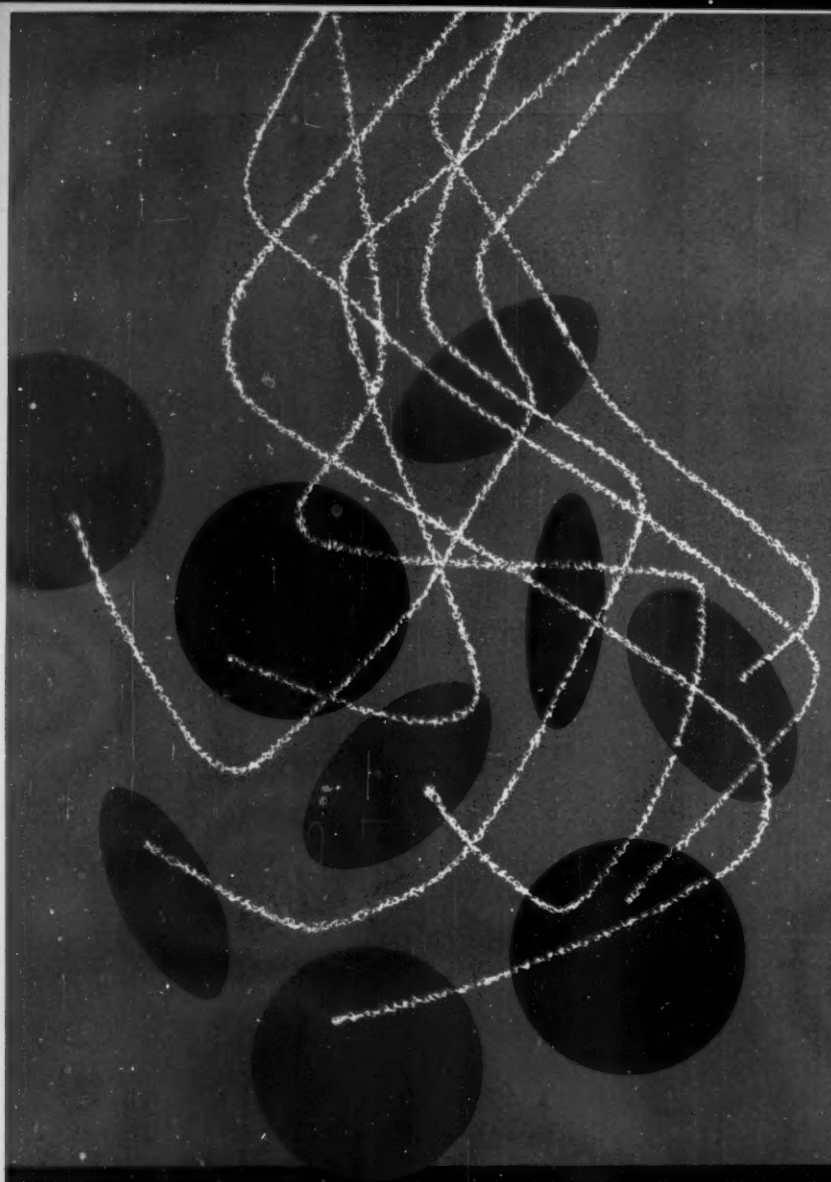
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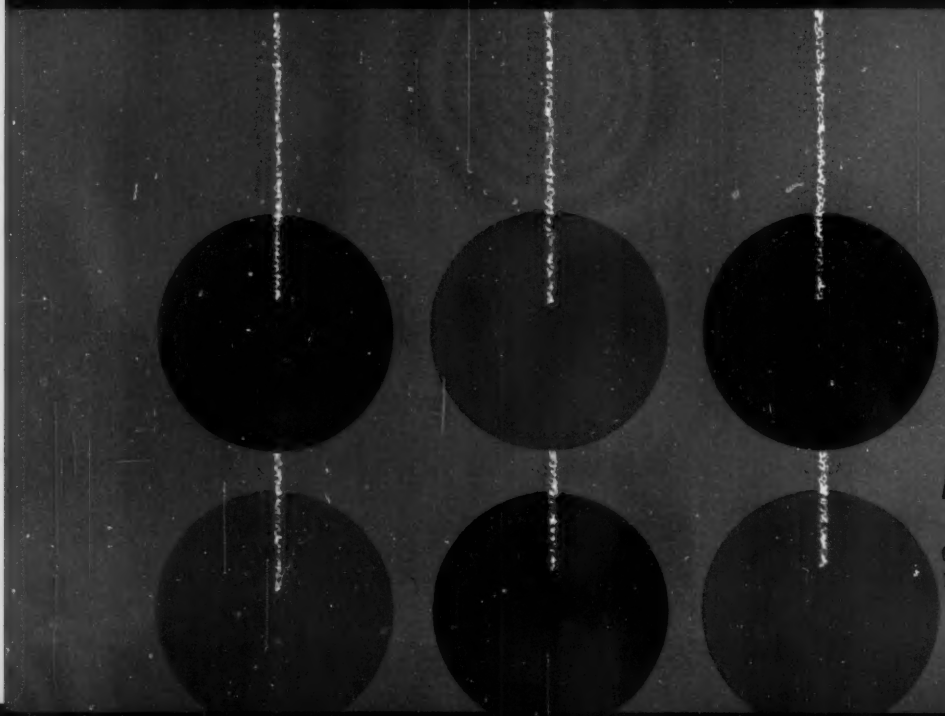
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SECTION 17

PACKAGING FOR PROTECTION AND SHIPMENT

Packing for preservation and shipment

Many new developments are contributing to advances in the field of packing, preservation and packaging for effective shipment and handling. The newer plastics such as polyester, high-density polyethylene, polypropylene, acetal and the various forms of foamed plastics offer improved properties and functions. Containers such as blister packs and shrink packs mean new efficiency and economy. Methods such as containerization are influencing gains in packaging methods. And over-all there are widespread advances stemming from the many excellent engineering approaches which the field is engendering.

Many aspects of packing, preservation and packaging for shipment are covered in separate articles in this section including cushioning materials, corrugated pads, steel strapping, film liners and plastic shipping containers, as well as standard types of shipping packages such as boxes, fibre drums, metal drums and shipping bags. In other sections of this book, the reader will find additional related articles dealing with papers, films, foils, coatings, tapes, stapling, plastic foams and the like, as well as discussions of the various forms of primary or individual inner packaging.

The discussion here is limited to the subsidiary aspects of packing, preservation and shipment. It is predicated on the assumption that the inner and the external containers that will be involved have been selected properly.

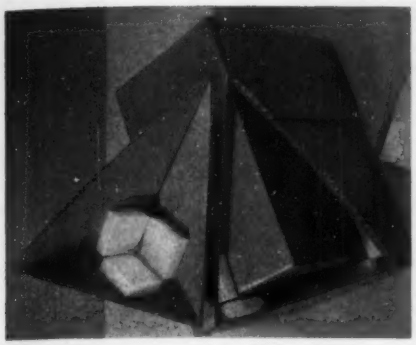
For protection is obviously a function of both the outer shipping container of a product and the associated packaging materials and tools, which range from interior fittings, such as bracing details, to external components exemplified by steel strapping. Efficient selection of outer shipping containers is not universally practiced, but is more common than proper engineering and use of allied materials, probably because the functional



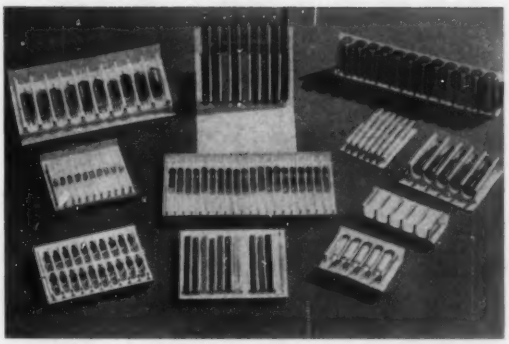
FRAGILE laboratory apparatus of Fisher Scientific Co. is snugly wrapped in cellulose wadding—so soft it does not abrade the delicate surfaces, so strong it protects pieces against breaking or chipping. It also entraps grit and foreign particles which might enter. (*Photo, Cel-Fibe Div., Personal Products Corp.*)



NEW SPAGHETTI-LIKE FOAM used as loose fill by GE reduces dunnage problem by 25% for turbine parts. GE foams densities as low as 0.25 lb./cu.ft. Strands prevent settling out, are not subject to spontaneous combustion. Three inches of foam replace four inches of excelsior. (*Dow photo*)



CORNER PADS of expanded foamed plastic cushion fragile items. Eight corners, of three pads each, shockproof items of up to 25 lbs. (*Pac-Tron photo*)



FLUTED-PAPER partitions firmly hold such items as electronic parts, pens, tubes, etc. (*Rondo of America photo*)

aspects of shipping containers have been better evaluated and publicized.

A cardinal point frequently overlooked in protecting shipments is that the optimum choice of supplementary materials and devices presupposes a thorough knowledge of the item being packaged, its inherent properties and margins of safety; the methods of storage, handling, shipment and distribution, and the environment.

Protective packaging can be analyzed from various standpoints. One way of analyzing requirements involves the cataloging of the more common considerations and hazards dictating the choice of safeguards, a brief description of each and a listing of the categories of the basic materials which may be used.

1. *Retention of the load.* The conventional closure media include adhesives, metal stitches or staples, tape, metal banding and cordage. The last three play a dual role in that they also reinforce the container.

The chief types of tape are paper, laminated paper with and without reinforcing fibres, cloth and pressure-sensitive tapes. Metal banding comes in round wire or flat strapping and is available in a range of gauges for the former and thicknesses for the latter. In addition, reinforced plastic banding can be employed.

2. *Separation of the load* to obtain optimum distribution is effected frequently by means of inner containers. These are commonly of wood, plywood and corrugated or solid fibreboard. Paper in the form of bands, wrappings, bags or envelopes is also used. The media associated with blocking, suspension and clearance include wood, corrugated and solid fibreboard, and newsboard.

3. *Support of the load* against distorting forces, such as compression and wracking, may take the form of metal or wood frames, bases, skids, etc. Reinforcements lining the side and end walls also protect against these hazards as do diagonal cross pieces within the container. In most instances, these liners and diagonals are made from paperboard. Fibreboard or wood corner posts should not be excluded from consideration, but the cost of supplementary supporting devices must be evaluated. Foamed plastic supports, corner pads and the like are being used effectively.

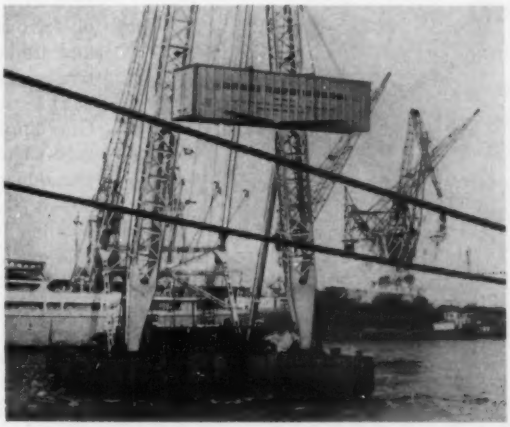
4. *Prevention of abrasion* may involve positioning of the product so that finished surfaces do not come in contact with the shipping container or interior packing parts; or it may comprise insertion of extra protective material between the finished surfaces and the packing element. Insert materials include cellulose wadding, which may be unbacked sheets, paper-backed or embossed sheets, and macerated newsprint or excelsior within two retaining paper linings that may be coated or impregnated with a suitable material.

5. *Resistance to shocks.* The basic principles followed in providing resistance to shocks and vibrations are: (1) Be sure that the maximum acceleration of the item in the package is kept at a level consistent with its own limitations; (2) avoid build-up of undesirable phenomena such as resonance. A wide range of supplementary packaging materials is available for protection against these hazards in handling. These cushioning materials include tension springs, cellulosic materials, excelsior, straw, hay, grass, shredded and macerated paper, vermiculite (a granular form of mica), sponge, foam latex and unicellular rubber, sawdust, wood shavings, animal hair, fibres such as cactus bonded with rubber, cork, glass fibres, corrugated fibreboard in all forms.

Probably the most widely used cushioning material is corrugated fibreboard. There is a variety of forms, the commonest being scored sheets folded to form air cells and accordion-pleated pads with or without cut-outs to fit the packaged article. Blocks made from layers of corrugated board serve efficiently for heavy articles such as refrigerators and motors. (See p. 682.)

6. *Defenses against water, moisture and grease* can be divided into several groups. One includes coatings, hot- and cold-dip strippable compounds and petroleum preservatives.

Another group includes waterproof



CONTAINERIZATION. Significant changes and advances in protective packing and packaging are stemming from new techniques in bulk shipments. Here, 117 outboard motors, shipped from Minneapolis in 32-ft. sealed door-to-door container, are off-loaded at Rotterdam. Each motor is packed in a domestic corrugated fibre box. (*Container Transport International photo*)



SHELLS are transported by U.S. Army in their carrying case lined with resilient form of foamed polystyrene—completely protected, and insulated against temperature extremes. (*Resilo-Pak, Armstrong Cork*)



CAR VALVES and components in transparent bubble packs hook onto masonite board, for counter or wall. Parts are protected, yet packs can be opened and closed easily. (*"Slide-Plax" packages, Plaxall*)



TWO-STRIP sealing gives secure, dustproof closure. One strip is applied to top and/or bottom of seam, overlapped. Tape is kraft laminated with reinforcing strands. (*Photo, Sisalkraft Div., St. Regis*)

liners in the form of bags and sheets with overlapping seams. These barriers sometimes are vented or remain unsealed. They usually are made of laminated, coated or impregnated papers which may be flat, creped in one or two directions, or occasionally reinforced with fibres in one or two directions. The coatings or impregnants may be wax, resins, etc.; the barriers may be asphalt, film or foil.

Since corrosion rarely occurs without the presence of moisture, a low relative humidity must be maintained within the package. This will prevent condensation of moisture on ferrous metal parts when changes in temperature occur. Water-vaporproof barriers are utilized to enclose the packaged item in the form of bags, liners or pouches. Closure is usually accomplished by heat sealing after entrapped air is exhausted by vacuum suction. The materials used for water-vaporproof barriers include lead and aluminum foils, paper or scrim backed, laminated polyethylene, etc.

Desiccants. When the volume of air enclosed in the barrier is relatively large, it is common practice to use a desiccant to maintain the relative humidity at or below approximately 30%. The amount of desiccant needed is computed, taking into account the water-vapor transmission rate of the barrier material, the area of the barrier itself and the amount of dunnage enclosed. Silica gel and calcium chloride are the most common products used in dehydrated packs.

Volatile corrosion inhibitors (VCI) derive from a certain class of chemicals, the most familiar of which are dicyclohexyl-ammonium nitrite and sodium nitrite urea. These chemicals give off a vapor that inhibits corrosion of ferrous and certain other metals and are highly regarded in the protective packaging field. Two processes are used in producing VCI for packaging. One applies a coating to materials such as kraft paper, the other involves impregnation of fibrous materials. VCI papers should be placed as close as possible to all surfaces of the item. VCI packaging is primarily designed for the protection of iron and steel parts. Care should be exercised when it is used with nonferrous metals as well as nonmetallic surfaces, although aluminum parts appear to be protected when VCI is used for packaging.

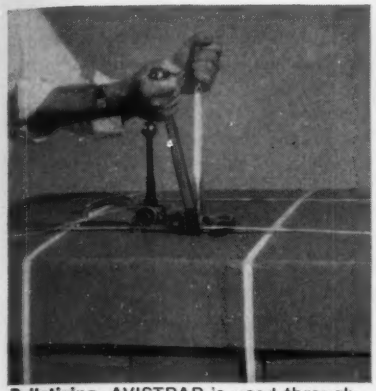


SHOCK TESTER is housed in case of tough, impact-resistant butyrate through which tape can be read. Recorder measures protection packages give contents, type of shock received. (*Impact-O-Graph recorder; butyrate, Eastman Chemical Products*)

Whether VCI or some other method is chosen to inhibit corrosion, it is essential to follow established cleaning methods before packing the article to be protected. None of these methods will remove rust and they are less effective when corrosion has developed in the article before packaging. Grease-resistant materials, such as laminated films and foils, wax-impregnated or wax-coated papers, glassine or other paper products, either in sheet form or incorporated in interior unit containers, are generally used in order to retain any light oils.

7. *Safeguards against temperature extremes.* The principles incorporated in the prosaic Thermos bottle often are embodied in protective packaging to safeguard against extremes of temperature. Materials used to surround the packaged item and create insulation or dead air include built-up corrugated fibreboard forms identified by various trade names, macerated newsprint between two paper facings furnished in liner or bag form, glass-fibre materials, mineral-wool mats and pads and, for some of the larger articles, various types of quilted pads. Lead or aluminum foil, laminated to inner or outer surfaces of other packaging media, are sometimes applied to serve as reflectors and thus reduce undesirable temperature changes. Among the most effective insulating materials are the various types of foamed plastics. (See p. 287.) Pre-cooling or pre-heating the package or using dry ice minimizes product spoilage.

NEW IDEA AT WORK



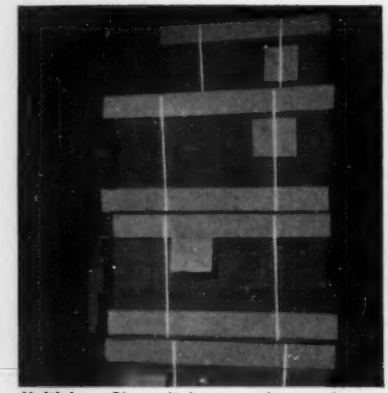
Palletizing. AVISTRAP is used throughout industry to secure products ranging from die-castings to millwork, in palletized units weighing thousands of pounds.



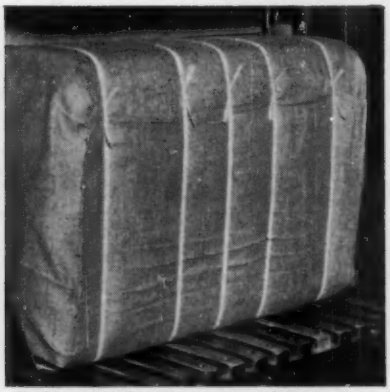
Reinforcing. Because it is flexible, tensions around corners with little crushing, AVISTRAP is ideal for reinforcing large cartons used in shipping bulky materials.



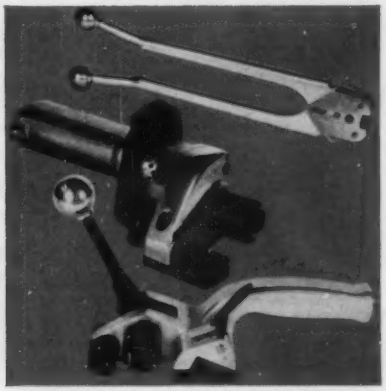
Banding. AVISTRAP is highly useful for banding because it is easy to apply, does not cut into the product and is easily removed and disposed of at destination.



Unitizing. Since it has no sharp edges, AVISTRAP has no tendency to damage merchandise such as these flat cartons. Flexibility helps make strapping easier.



Baling. Textile bale shown weighs approx. 700 lbs. AVISTRAP replaced metal in this application in over 100 mills because of ease of application and economy.



Tool Selection. A selection of AVISTRAP pneumatic and hand tools is carefully designed to fill needs of many different industrial strapping applications.

AVISTRAP® CORD STRAPPING

AVISTRAP®
CORD STRAPPING*

*Patents pending

Out-performs metal many ways. More energy is required to break AVISTRAP than equivalent-width metal strapping. AVISTRAP simply absorbs greater shock upon impact, keeps packages together long after metal strapping would have reached its breaking point. AVISTRAP will not lash out with jagged ends if broken, will not snag handlers' hands or other packages. For these reasons, in addition to light weight and easy handling, AVISTRAP is now used by the textile, paper, automotive, lumber, hardware, and many other industries. Request information or an in-plant demonstration of advantages AVISTRAP offers your industry by writing to Industrial Packaging Department, American Viscose Corporation.

AMERICAN VISCOSE CORPORATION, INDUSTRIAL PACKAGING DEPT., 1617 PENNSYLVANIA BLVD., PHILA. 3, PA.
District Offices: Atlanta, Ga. • Boston, Mass. • Charlotte, N. C. • Chicago, Ill. • Columbus, Ohio • Dallas, Tex. • Los Angeles, Calif. • New Orleans, La. • New York, N. Y.

See other Avisco packaging materials, pages 56, 57, 186 and 381.

Cushioning for critical protection*

Packaging engineers have a wide choice of materials and devices with which to avoid even slight physical or chemical changes in critical items during shipment. The nature of an item, its future application and transportation factors demand different precautions in cushion packaging.

The chart below lists materials that can be used singly or in combination to provide desired properties. The findings are based on static rather than dynamic test conditions. Among the important properties are these:

* Information on this page supplied by Cargo Packers, Inc., Glendale, N.Y.

Compression set. Capacity of material to return to original thickness after compression under standard load for given time. This property determines whether cushioned item can remain in storage for extended period without causing cushion to set and create free-moving space with resultant danger of damage.

Damping. Unreturnable portion of energy absorbing property of cushion. Very soft material is excellent—it dampens or smothers impact shock. Materials such as vermiculite and cellulose wadding are excellent—they absorb punch. A spring, however, transmits shock—hence poor damping.

Density. Weight of cushioning material per unit volume, normally expressed in pounds per cubic foot. An inflatable cushion has low density in relation to its weight per cubic foot.

Low temperature performance. Materials tending to become stiff and brittle at low temperature lose cushioning properties. Extremely important factor in high-altitude air transport and shipment to arctic regions.

General corrosive effect. Some materials react with packaged item, inducing corrosion—important consideration with critical metal surfaces.

Properties of selected cushioning materials

Material	*Compression set*	*Damping*	*Density*	*Dusting*	*General corrosive effect*	*Moisture absorption*	*Moisture content*	*Fungus resistance*[1]	*Low-temperature function*
Animal hair, bonded									
Sheet	Slight	Fair	Average	Slight	Slight	Slight	Low	Poor	Good
Molded	Slight	Fair	Average	Slight	Slight	Slight	High	Poor	Poor
Foam rubber, molded	Slight	Fair	High	Much	Slight	Much	High	Poor	Poor
Blown vinyl flexible foam	Much	Good	High	None	Slight	Much	Low	Good	Poor
Air pillow—vinyl cradle	None	Fair	Low	None	None	None	None	Excellent	Good
Vinyl cradles in suspension	None	Fair	Low	None	None	None	None	Excellent	Good
Springs	None	Poor	—	None	None	None	None	Excellent	Good
Canvas slings	None	Fair	—	None	None	None	None	Poor	Good
Honeycomb kraft paper	Much	Excellent	Low	None	Slight	Slight	Low	Poor	Good
Excelsior	Much	Excellent	Average	Very high	Much	High	High	Poor	Poor
Shredded paper	Much	Excellent	Average	Very high	Much	High	Low	Poor	Good
Plastic foams									
Polyethylene, molded	Slight	Excellent	Low	Slight	None	Low	None	Yes	Good
Polystyrene, molded	Much	Excellent	Low	Varies	None	None	Low	Good	Good
Flexible sheet	Slight	Excellent	Low	Slight	None	None	Low	Good	Good
Polyurethane, rigid	Much	Excellent	Varies	High	None	High	High	Poor	—
Polyurethane, flexible	Slight	Excellent	Varies	None	None	High	High	Poor	—
Cellulose wadding									
Creped	Much	Excellent	Average	Much	None	Slight	Low	Poor	Good
Homogeneous	Varies	Excellent	Varies	Varies	None	Varies	Low	Poor	Good
Cotton	Much	Excellent	Low	Much	None	Much	Low	Poor	Good
Plant fibres rubber bonded	Slight	Fair	Average	Slight	Slight	Slight	Low	Poor	Good
Fibreglass	Slight	Fair	Average	Slight	Slight	Slight	Low	Good	Good

1 Poor fungus resistance can be avoided with various treatments.

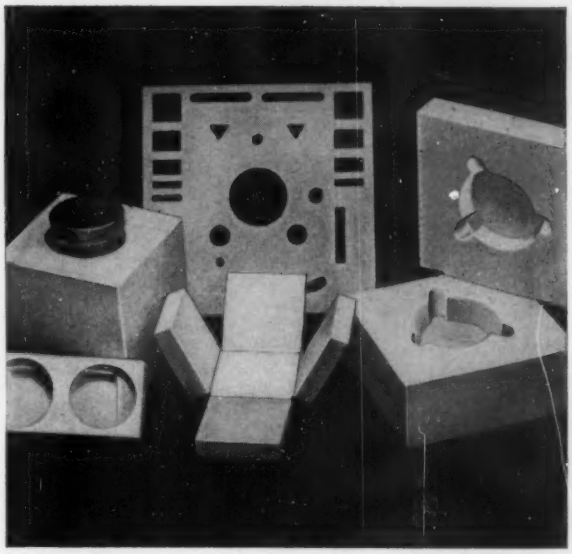
Armstrong Resilo-Pak Package Cushioning designed for the engineered package

Armstrong Resilo-Pak is a highly resilient package cushioning. It is made from polystyrene beads expanded in molds and cut to standard sheet sizes. Three types are available, in order of increasing stiffness and energy absorbing capacity.

Resilo-Pak 200—0.5 lb./cu.ft. (average)
Resilo-Pak 300—0.75 lb./cu.ft. (average)
Resilo-Pak 400—1.3 lbs./cu.ft. (average)

Resilo-Pak is non-corrosive, and has no odor. It is non-dusting and non-abrasive. The material can be fabricated with woodworking equipment, and by die-cutting, hot wire cutting, heat deformation, and cementing. Its thermal conductivity is low, allowing it to serve as thermal insulation as well as cushioning. It meets all requirements of Interim Federal Specification PPP-C-00850 (GSA-FSS).

For samples, and a free handbook on selection of Armstrong Resilo-Pak Package Cushioning, write today to Armstrong Cork Company, 3100 Pearl St., Lancaster, Pa.



RESILO-PAK IS A TRADE-MARK OF ARMSTRONG CORK COMPANY

Physical Properties of Armstrong Resilo-Pak

PROPERTY	UNITS	Resilo-Pak 200	Resilo-Pak 300	Resilo-Pak 400	TEST METHOD
pH	——	——Neutral——			ASTM D778-50
UPPER TEMPERATURE USE LIMIT	°F.	175	175	175	
WATER ABSORPTION	% by volume 24 hrs. 4 wks.	 4.0 6.0	 2.0 5.0	 2.0 5.0	MEP 94
THERMAL CONDUCTIVITY	Btu/hr. sqft(F/in) @ 75°F mean	0.29	0.27	0.23	MEP 99 ASTM C177-45
THERMAL STABILITY @ 158°F.	% Linear Shrinkage 24 hrs. 6 wks.	 0 0.1	 0.4 0.6	 0.7 0.9	MEP 95
COEFFICIENT OF THERMAL EXPANSION	in./in. per °F.	0.6×10^{-4}	1.0×10^{-4}	0.6×10^{-4}	MEP 45 Determined over temperature range of −108°F. to +140°F.
ABRASIVENESS	——	——Non-Abrasive——			Consolidated Freight Classification Committee Procedure
DUSTING	——	——Negligible——			Fed. Spec. PPP-C-843
FUNGUS RESISTANCE		——Excellent——			
CAPILLARITY		——None——			
THICKNESS LOSS 50% COMPRESSION 70% COMPRESSION	 % %	 13 15	 6 7	 6 7	ASTM D1372-55T Modified (Punch Press)
OPTIMUM STRESS	lbs./sq. in.	20	30	60	ASTM D1372-55T
OPTIMUM STRAIN*	in./in.	.6	.7	.7	Modified
ENERGY ABSORPTION	in. lbs./cu. in.	5.8	7.2	13.2	ASTM D1372-55T Modified
CREEP (DRIFT)	% of Original Thickness after 24 Hrs.—max.	5.0 @ 1.5 psi.	15.0 @ 0.75 psi.	5.0 @ 1.5 psi.	ASTM D1372-55T Modified
SIZES	in.	34 x 34	35 x 35	36 x 36	
THICKNESSES	in.	⅛ to 6	1/16, ⅛ to 6	1/16, ⅛ to 6	

MEP—MATERIAL EXAMINATION PROCEDURES USED BY ARMSTRONG CORK CO. COPIES AND FURTHER DETAILS AVAILABLE ON REQUEST.
*THESE ARE AVERAGE VALUES. THEY MAY VARY PLUS OR MINUS 0.05.

Armstrong RESILO-PAK



VARIETY of containers illustrates preprinted linerboard applications. (*St. Regis photo*)

Corrugated shipping containers

by J. Burk Mueller*

Corrugated materials, as distinguished from containers, were first patented in England in 1856 in the form of fluted material to be used in the sweat bands of hats. As a packing material, it was first patented in the United States in 1871 as unlined material used as cushioning and wrappers for bottled goods. By 1895, it was employed for light parcel post and express boxes. The first actual corrugated container is believed to have been used for freight shipment of lamp chimneys.

In 1914, the Interstate Commerce Commission ruled that railroads should no longer discriminate against fibre boxes. This, in effect, started corrugated containers on their way to becoming the most widely used of all types of shipping containers.

Indeed, today there is hardly an item of commerce that may not be packed in corrugated containers. The material provides: cushioned protection; light weight; ease of handling and storage; the benefits of mechanical methods in opening, filling, sealing and handling; and attractive appearance for merchandising opportunities. They are fabricated by high-speed mass production methods and, as a result, corrugated containers are readily available in many styles and sizes and are relatively low in cost.

From this list of plus factors, it follows that the basic functions of a corrugated container are: to contain the product placed into it; to give that product adequate protection according to its specific requirements; and to provide, through printing or design, proper identification of the contents, merchandising appeal and ease of opening.

*Director of Research & Development, Corrugated Container Div., St. Regis Paper Co., New York City.

Manufacture

Corrugated board is made or combined on a large machine called a corrugator, which usually produces board in widths from 60 to 85 inches.

The corrugating medium, a web of paperboard, is heated and moistened by a steam shower and fluted during passage through two parallel fluted rolls. After fluting, glue—usually starch or silicate of soda—is applied to the tips of the flutes while the flutes are still on the corrugating rolls. A ply of paper called the inner liner is then applied by pressing it against the flutes by means of a heated pressure roll. This single face sheet is conveyed over a bridge and passed over another glue roll which applies adhesive to the tips of the flutes on the outer side. The outer liner then is pressed against these flutes while the combined board is passed over the hot plate or dryer sections.

After the board has passed through the drying and cooling section, it is scored and cut parallel with its length by the slitter (forming the flap scores) and then cut to proper length by the cut-off knife. Board is combined at speeds up to 500 feet per minute. The normal direction of the flute is vertical, or from top to bottom of the box.

Corrugated board may be single face, double face, double wall or triple wall, though double face represents by far the largest proportion manufactured. Single face is a combination of one liner with a sheet of corrugating medium. It forms a flexible material for wrapping and cushioning objects that vary in shape or are shipped in such small quantities that it is not feasible to design a container for them. Double face, where one corrugating medium is sandwiched between two sheets of linerboard, is the most widely used form of corrugated material. The board provides rigidity and high cushioning power because the flutes of the corrugating medium are anchored at both sides to liners, form-



DAMAGE CLAIMS avoided by use of tear-tape-opening corrugated shipping container for tables. Special construction provides a tape joint down the center of the broad facing panel, and instructions for opening are on container face. Carton is jig for table assembly. (*Hoerner carton*)



IMPREGNATED MATERIAL used for container to ship onions permits application of blown ice for cooling. (*St. Regis photo*)

ing a continuous arch structure much like the truss section of a bridge.

When subjected to flat crushing (crushing of the arch structure), the corrugated medium has surprising strength in the range of 40 to 50 pounds per square inch. In double wall board, there are three sheets of linerboard which are combined with two corrugating members to form a board with a central liner. In triple wall, there are four sheets of liner and three corrugating members. Double face, double wall and triple wall boards are used in the manufacture of containers, but double wall and triple wall corrugated are reserved mostly for heavy-duty type containers.

The flutes of the corrugated media vary in their characteristics. There are three sizes known as A, B and C flute.

"A" flute is the highest and has the least number of flutes per foot. The board made from it, when used as a column, generally has greater stacking strength and better capacity to cushion or absorb the shock. "B" flute, which has the greatest number of corrugations per foot and lowest arches, is more rigid and less shock absorbent, but at the same time has increased crush resistance due to the fact that a load placing pressure against the thickness receives greater support from the additional number of points. "C" flute, which combines the features of the other two, has been used largely in the glass container industry, for it retains much of the cushioning ability of the "A" flute without sacrificing flat crush resistance.

Solid fibre. A second type of paperboard shipping container does not employ a fluted interior structure, but instead is fabricated from solid board consisting of several laminated plies. Solid fibre boxes are generally intended to serve extra-functional needs, including added strength, greater durability and longer use. For example, they are used as a multi-trip shipping case for 24 bottles of beer. Often the solid fibre container employs special coatings such as polyvinyl acetate or polyester film or bonding agents such as asphalt or urea formaldehyde to provide moisture barrier or wet-strength properties.

Types of containers

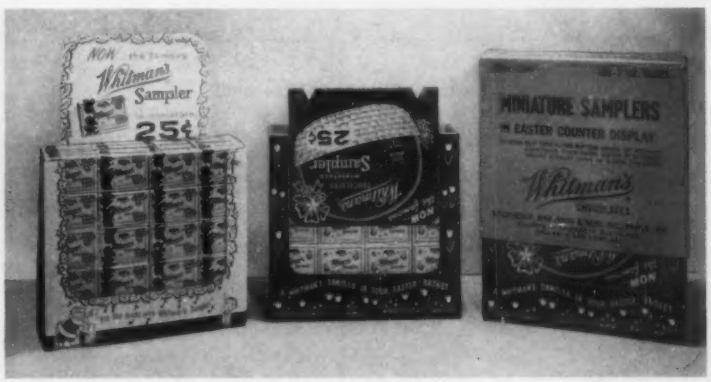
There are many styles of corrugated or solid fibre shipping containers and many styles of corrugated pads and partitioning:

Slotted styles. These are containers where the blanks have been cut or slotted to produce flaps. The style most widely produced—because in general it requires the least amount of board and is most economical to produce—is the *regular slotted container* (RSC). This style has flaps that are all the same length and the outer flaps meet when folded to close the container.

Special slotted containers include slotted constructions that vary the size and style of the flaps to provide special strength, opening, economy or similar features. Included in this group are the *center special slotted container* (CSSC), *full flap slotted container* (FFSC) and the *overlap slotted container* (OSC). A construction known



THREE-PIECE corrugated ensemble protects and displays night lights. Large master shipper holds 10 individual boxes, each containing one of the colorful displays. (*Hinde & Dauch photo*)



EYE-CATCHING display package of bleached-kraft corrugated linerboard with fine multicolor design sets up quickly on counter. Dealer removes sleeve and strips off a perforated section in carton's front panel, exposing miniature packages. The section serves as a display riser. (*Inland Container carton*)

as the *half slotted container* (HSC) has only one set of flaps, producing a tube-style tray or container with a bottom but no top flaps. The cover may be a telescoping lid or a hinged, attached flap.

Telescope styles. The body of this container is formed in a tube-shaped construction. It may have a bottom, or both ends may be open. Closure is made by a full- or partial-depth cover. Or, if both ends of the tube are open, double covers are required.

Folders. These include one-piece, two-piece and five-panel folders. Essentially they are scored and slotted sheets of corrugated that are shipped flat to the user, who then forms or folds them around the product to be packaged. They are characterized by ease of assembly and loading—especially for books, cylindrical items and similar products that require loading by hand.

Slide boxes. This style generally employs an outer tube-shaped sleeve into which one or more corrugated tray or folder components slide. Variations include *single lined, double lined, double slide* and *triple slide* styles. The different constructions afford a choice of strength, economy, assembly and use features. Slide boxes are popular for small, fragile items shipped by express or by parcel post.

Pads, partitions and inner packing. A wide range of scored, die-cut or slotted components are available for special jobs in bracing, supporting, protecting and displaying packaged products. (See diagrams on p. 682.)

In addition to the styles and forms listed above, there are specialized and patented constructions that should be sought out and studied whenever special protection, handling or use features are known to be desirable.

The style and type of a box has an important bearing on the steps required in the manufacturing process and on the final cost. For this reason, it is best to use the regular slotted case when possible, for it is the most economical method of fabrication.

Specifications and design

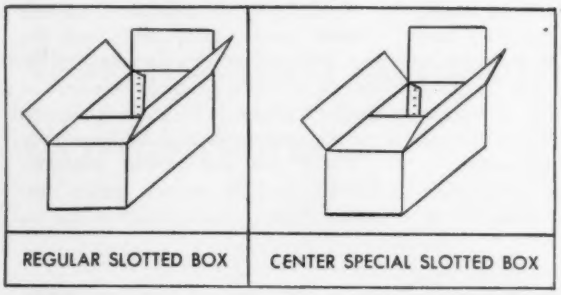
A box should be designed to give maximum service with minimum cost. To do this, one must take into consideration such factors as materials and methods of manufacturing as well as the packing and handling methods.

When working on a new package, it is first necessary to consult the shipping rules and regulations for the product to be shipped. These are set down in the Uniform or Consolidated Freight Classification, Rule 41; Motor Truck Classification, Rule 5; Official Express Classification, Rule 18; Transportation of explosives and other dangerous articles, Interstate Commerce Commission Regulations; Postal Laws and Regulations; Official Air Freight Rules, Tariff 1; and Freight Container Tariff. (See also table on shipping regulations, p. 702.)

Rule 41 of the Uniform Freight Classification, in general, sets forth the minimum strength tests of the combined board; the construction of manufacturers' joints; approved methods of sealing; permissible maximum weight of box and contents and maximum inside dimensions, together with the formula authorizing increased size when weight is less than the maximum specified. Section 3 of this rule gives the basic requirements of manufacturing and specifications for conducting the bursting test.

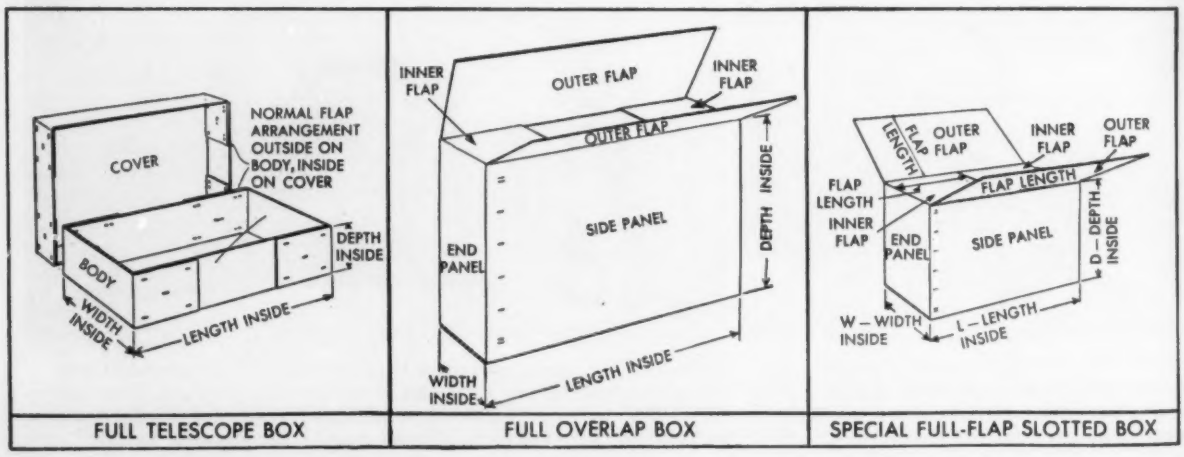
When considering a new package, it is necessary to be aware of many design factors. A list of some of the more important follows:

1. The hazards that will be encountered in warehousing, handling and shipping. It is important to determine how the containers are to be filled and closed, how high they are to be stacked during storage and shipment and if they will have to undergo any



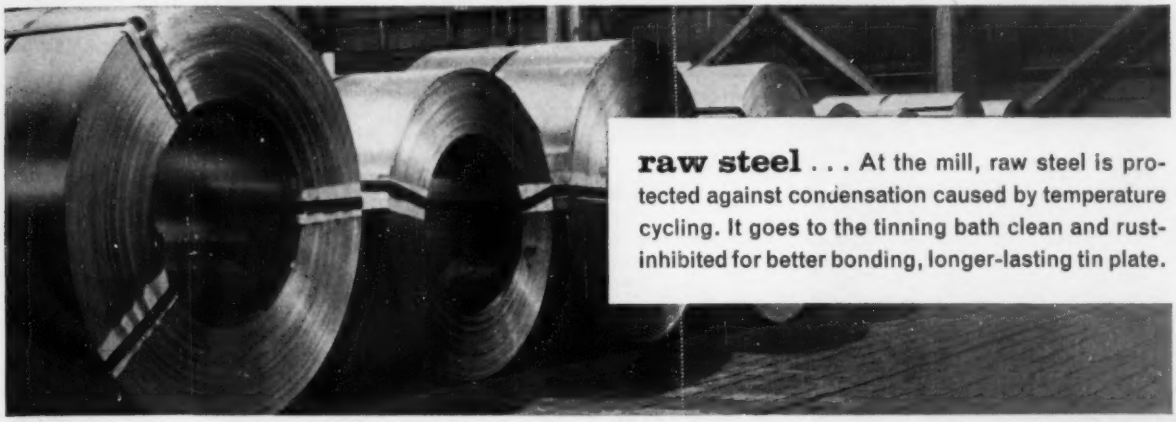
Basic box constructions

Regular slotted. Outer flaps meet; inner and outer flaps are the same length.
Center special slotted. Inner and outer flaps meet.
Full telescope. Cover depth usually equals over-all outside body height. Body slotting is at right angles in order to cover slotting.
Full overlap. Outer flaps have full overlap; inner and outer flaps are the same length.
Special full-flap slotted. Outer flaps have full overlap while inner flaps meet in the center.

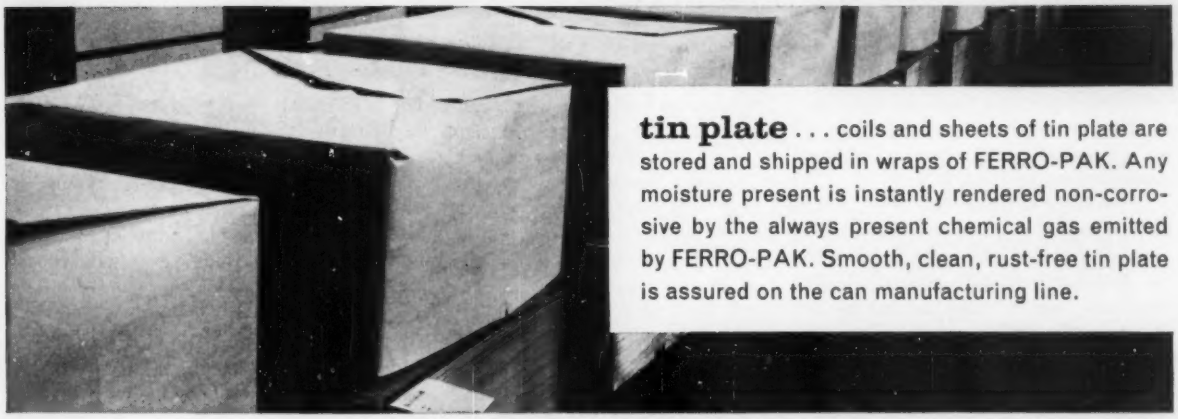


rust stopper...Cromwell Ferro-Pak!

Every step of the way . . . in process, in storage, in shipment—in raw steel form—after tin plating—as finished cans—FERRO-PAK treated paper offers dependable protection against corrosion and rust.



raw steel . . . At the mill, raw steel is protected against condensation caused by temperature cycling. It goes to the tinning bath clean and rust-inhibited for better bonding, longer-lasting tin plate.



tin plate . . . coils and sheets of tin plate are stored and shipped in wraps of FERRO-PAK. Any moisture present is instantly rendered non-corrosive by the always present chemical gas emitted by FERRO-PAK. Smooth, clean, rust-free tin plate is assured on the can manufacturing line.



finished cans . . . cans arrive at the packers in top-quality condition safeguarded in CROMWELL FERRO-PAK Can Bags—stay clean and free of rust even after bags are opened.

Every step of the way raw steel, tin plate, finished cans are fully protected with CROMWELL FERRO-PAK

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180 North Wabash Avenue · Chicago 1, Illinois
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Manufacturers of: Papers (Impregnated • Coated • Laminated Reinforced • Flexible) • Bags • Sacks • Liners • Covers (Single and multiwall construction, using all types of material to carry, cover or protect all types of products.)

Corrugated structures

ARTWORK COURTESY HINDE & DAUCH

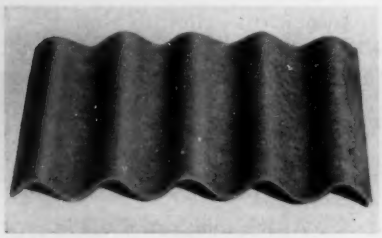


Figure 1—corrugating medium

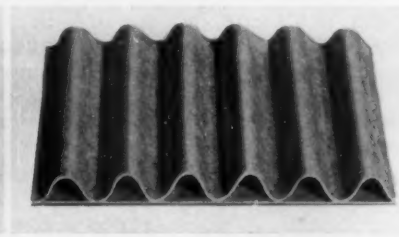


Figure 2—single-face

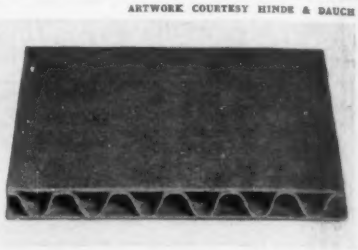


Figure 3—double-face

Corrugated board is made with fluted or corrugated sheet (Figure 1), usually of 0.009-in. thickness, attached to the facings of liners by adhesives. There are three common forms in general use: *single-face corrugated* (Figure 2) which is made of one ply of liner material pasted to one ply of corrugating medium; *double-face* (Figure 3) which has one ply of corrugated between two plies of liner material; *double-wall board* (Figure 2 plus Figure 3—corrugating medium of single-face is adhered to outer liner of double-face) which has three plies of liner material separated by two plies of corrugated.

Three flute sizes widely used in the industry are designated A, B and C. The dimensions given in the following table are subject to considerable variation among different manufacturers and combined-board caliper will vary with the thickness of the liners used.

Flute characteristics of corrugated board

Type	*Flutes per ft.*	*Flute height, in.*	*Thickness of board, in.**
A flute	35-37	0.185	3/16-7/32
B flute	50-52	0.105	1/8
C flute	41-45	0.145	5/32

* For 200-lb. test combined board.

unusual conditions such as high humidity, or exposure to water spray or excessively high, low or cycling temperatures.

2. Weight of contents.

3. Properties of contents that would influence design. The container should be designed to protect the product's weakness and to take advantage of its strength.

4. The dimensions of the contents should be measured accurately, noting the location of parts needing protection as well as parts which might be used as bearing surfaces for supports.

5. Inside dimensions of container. Container dimensions always are given as length, width and depth, and are given in that order. Length and width refer to the dimension of the opening of the box.

6. Style of container.

a) Regular slotted carton, special slotted carton or special design carton

b) A, B or C flute

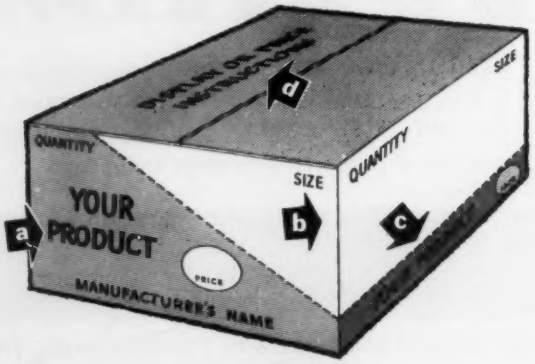
c) Type of corrugating medium (regular, heavy duty or moisture-resistant type)

d) Manufacturers' joint (where edges of box blank are joined by stitching, gluing, taping)

e) Type of adhesive (regular, moisture resistant or moistureproof).

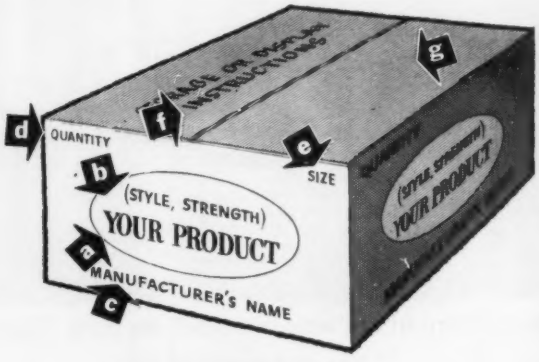
7. Vertical or horizontal corrugations. Normally containers are made with vertical corrugations. However, if boxes are to be stored on their side or are end-opening in design, then the stacking strength will be needed in

The ABCs of using shipping surface*



FOR SALES EFFECTIVENESS

a–Select type face with large openings
b–Keep corners free of printing
c–Clearly indicate "cut" lines
d–Give display or price instructions on top
• Select good contrasting colors; avoid large blocks



FOR IDENTIFICATION

a–Print name on all four sides
b–Indicate style on all four sides
c–Put manufacturer's name on all four sides
d–Show case quantity on all four sides
e–Print package size on all four sides
f–Handling and storage instructions
g–Leave space for label

*Based on recommendations of the National Wholesale Druggists' Assn.

other directions. The greatest stacking strength is parallel to the direction of the corrugations.

8. Materials to be used.
9. Inner packing required.
10. Machine limitations of plant making the containers.
11. Opening features.
12. How package is to be sealed (by hand, by machine).
13. Performance specifications (top or end load requirements, safe transit tests and storage conditions).

Printing

Information to make handling, inventorying and use more efficient is an increasingly important consideration in printing the shipping case. This is as true for industrial products as it is for those that require merchandising functions of the container. Beyond identification and shipping and handling instructions, printing is obviously an important advertising and promotion medium. This being true, at no time should the advantages of special premium promotions, point-of-sale display and carrying home of the well-printed container be overlooked.

Generally, corrugated board moves to the printer slotter in the form of scored blanks. Most printer slotters can print in two colors, but three and four color presses are available. The boxes are printed with rubber printing dies, with the dies usually mounted on mats fitted around the printing cylinders. The press can be adjusted so that the dies do not crush the flutes of the board more than is necessary during the process of printing. The dies are inked by means of ink distributed from an ink fountain by a series of rolls. The inks are usually of a paste-like consistency, and are either oil based or moisture-set in type. Oil-based inks usually result in a glossier printing job than that provided by moisture-set inks, but take longer to dry.

Corrugated printing has remained a relatively routine operation because of the rough nature of the corrugated board. However, dramatic new developments in this area should go a long way in perfecting printing quality.

Preprinted linerboard, a recent development, is the technique of controlled printing in multicolors on roll-stock in advance of corrugated board fabrication. This method results in corrugated boxes in intricate design and construction in four colors—but done in such a manner as to produce



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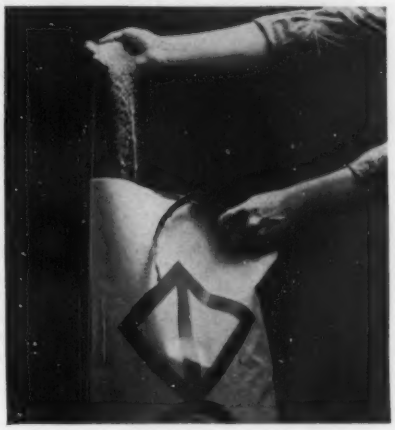
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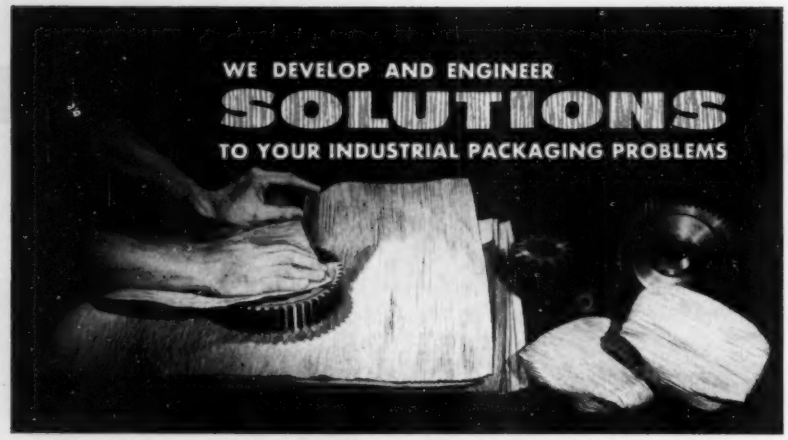


TURN TO SECTION 3

Page 101

Find out how International Paper's "Levels of Protection" enable you to buy the *exact* moisture-vapor protection your product requires without guesswork.

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Recent developments

Within the shipping container field, there is continued activity in the search for improved designs, methods and materials.

One of the supplementary products which has greatly affected the container industry is the development of a latex adhesive that seals only to itself. By application of this material to the flaps of the container, at the box plant, the box can be sealed by the user without the need of case-sealing equipment. The self-sealing container, once closed, needs only applied hand pressure to complete the sealing.

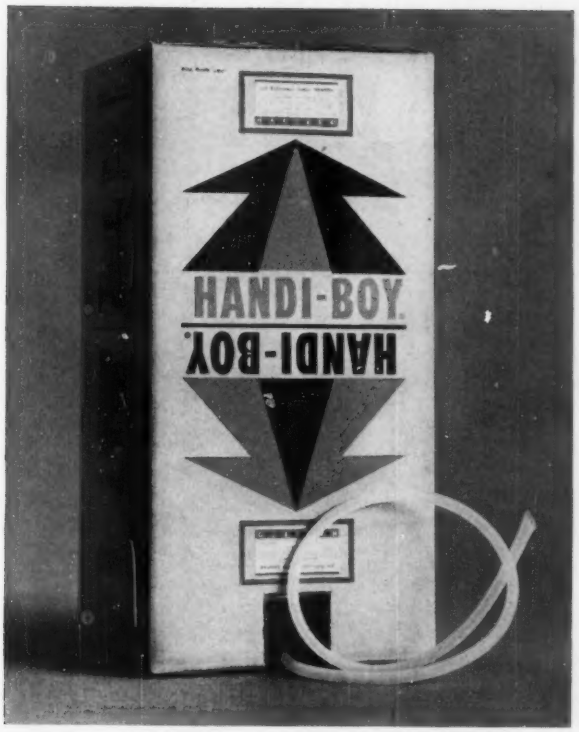
Another of the industry's advances has been the development of the impregnated materials currently being used in ice and wet packs. The methods and processes used in these materials are responsible for the development of a wide range of containers that provide packing, shipping and storage for products handled in high humidity conditions or ice packed or subject to excessive moisture.

Impregnation developments to answer other packing problems such as abrasion, heat and grease resistance continue, and research within the industry is responsible for a number of advances adding to the strength and rigidity of paper.

Research and development continue in the area of laminates and the combining of paper and other materials to accomplish particular ends. Lamination of polyethylene, polystyrene, foils and other materials is increasing and the industry has begun to make real progress in this field. Current trends indicate increased combining of paper with plastics, wood, metals and other basic materials. Plywood sandwiched between sheets of corrugated board adds strength and rigidity without taking away the cushioning qualities inherent in corrugated paperboard. This combination is finding widespread use in the large-appliance packaging and bulk-container fields.

The bulk-container field, itself a new development, grows in importance because of extensive changes in materials handling. Large corrugated containers now can handle weights in excess of two tons.

Some corrugated combinations are

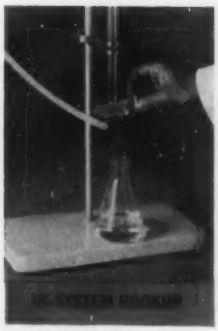


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the result of changes in methods of transportation used for shipping. Air freight has increased the importance given to weight of shipping containers. One material that is light weight, a good insulator, provides moisture-barrier qualities, is chemically inert and lends itself to many new applications is essentially a sandwich of foamed styrene between specification kraft paper.

The combining of heat-sealed polyethylene bags with corrugated containers for the shipment of liquids and semiliquids is another promising development. It is an economical answer to the packaging of liquids. The greater ease in handling and lighter weight afforded by this application are paving the way for widespread usage.

Another application of plastics in the shipping container field is the use of foamed styrene and urethane in interior packing. Although at present this is slightly more expensive than paper materials, it is drawing increased interest. Advantages include high cushioning values and the fact that the foams can be shaped, constructed and positioned to perform specific jobs of bracing, blocking and cushioning. (See also article on plastic foams in Section 8.)

The export-import business continues to present the container industry with challenging problems in shipping. During the past year, a banana box has been developed in which hands of bananas can be packed. This corrugated container is capable of withstanding the high humidity and temperatures of the tropics as well as the crude surface transportation employed before the produce is transferred to water transportation.

There is also a considerable market for express shippers for tropical fruit and vegetables. Some of this produce, for the most part extremely perishable, requires the maximum of protection in handling and shipping but needs a fast, easily packed and sealed container. New corrugated containers have been developed for this purpose.

The self-service brand of selling that is currently popular has tended to increase the importance of designing a container with ample color and sales appeal. In addition, modern merchandising has triggered many innovations related to easier opening and secondary-use features, including containers designed for tray-type palletizing and display of products sold in self-service stores.

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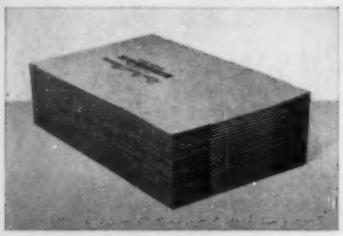
Specify HINGE-FOLD® Trademark for STRONGER *Consistently Better* Corrugated Cartons

"Hinge-Fold," a new concept of corrugated creasing and folding, produces cartons which set new standards of accuracy, uniformity and strength.

Illustrated at left is the exclusive Hinge-Fold. This crease, which is in effect a dual hinge, is made by unique male and female formers in combination. The double hinge has the effect of forming the corrugated board into a column which minimizes compression of the inner liner and stretching of the outer liner when folded.

Hinge-Fold cartons have increased top-compression strength, and resist folding fractures, even when stored in dry places. Hinge-Fold eliminates the abrasion and tearing action of knife-edge creasing which have long plagued the industry.

The next time you buy cartons, specify "Hinge-Fold."

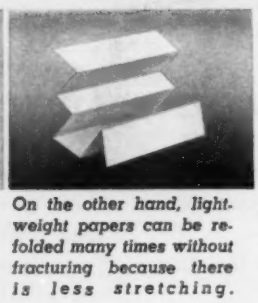


Here's proof of the accuracy and squareness of cartons made with the International Hinge-Fold. Tests by Container Laboratories, Inc. proved that Hinge-Fold cartons were "Consistently better . . . in all properties measured." Write us for a copy of their report.

HOW HINGE-FOLD BUILDS BETTER STRONGER CARTONS



You can't "fold" a piece of lumber. Because of its thickness the fibres on the outside will stretch, and then fracture completely.



On the other hand, lightweight papers can be refolded many times without fracturing because there is less stretching.



Heavy boxboard must be scored to permit folding. Note how Hinge-Fold score creates dual hinges which minimize stretching.



Note the stress on the upper crease made with common rotary score. Compare it with the square strain-free Hinge-Fold.

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Corrugated interior packing*

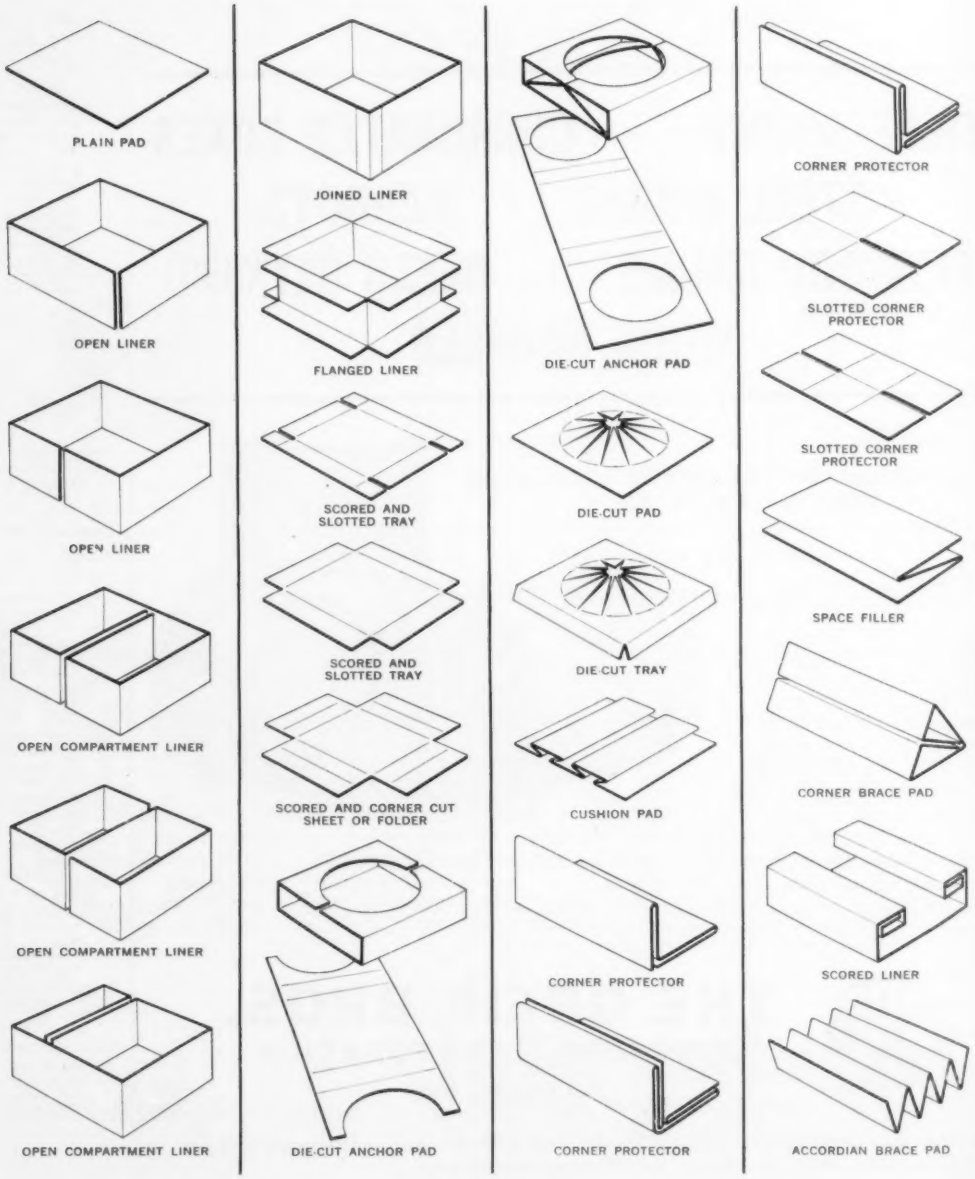
Interior packing as a supplement to a package provides one of the most effective and efficient means of product protection.

Its purpose is to guard the packaged product against the most common forms of shipping damage: impact, vibration, pressure and displacement, and abrasion.

All products need some type of protection. It isn't only fresh fruits, delicate figurines, glassware and appliances that suffer from some form of in-transit damage. Routine handling in the rush from warehouse to train to truck to store takes its toll on the so-called "hard" goods as well as on products which normally come under the heading of "fragile." The dented can is shoved aside by shopper after shopper and remains on the shelf long after the unmarred units have found their way into the consumers' shopping bags. A scratched table goes back to the factory for replacement. A bronze valve can have its threads stripped by too much shifting. The impact of an accidental fall can break the handle of a tool or utensil. Or appliances can have their attractive surfaces defaced by scratches.

By the use of different types of interior packing—pads, partitions, liners and die-cut sheets—all products can

* Information and drawings courtesy Hinde & Dauch



be kept motionless through distribution. The shocks of bumps and bounces can be absorbed. Special impregnants or coatings can be applied to interior packing to provide resistance against moisture or humidity, grease, dirt, abrasion and the like.

The accompanying illustrations show many of the different elements of interior corrugated packing available—ingenious devices that pay for themselves by the protection they offer.

The *plain pad*, for instance, can be used for added protection or for separating tiers or layers of articles packed for shipment.

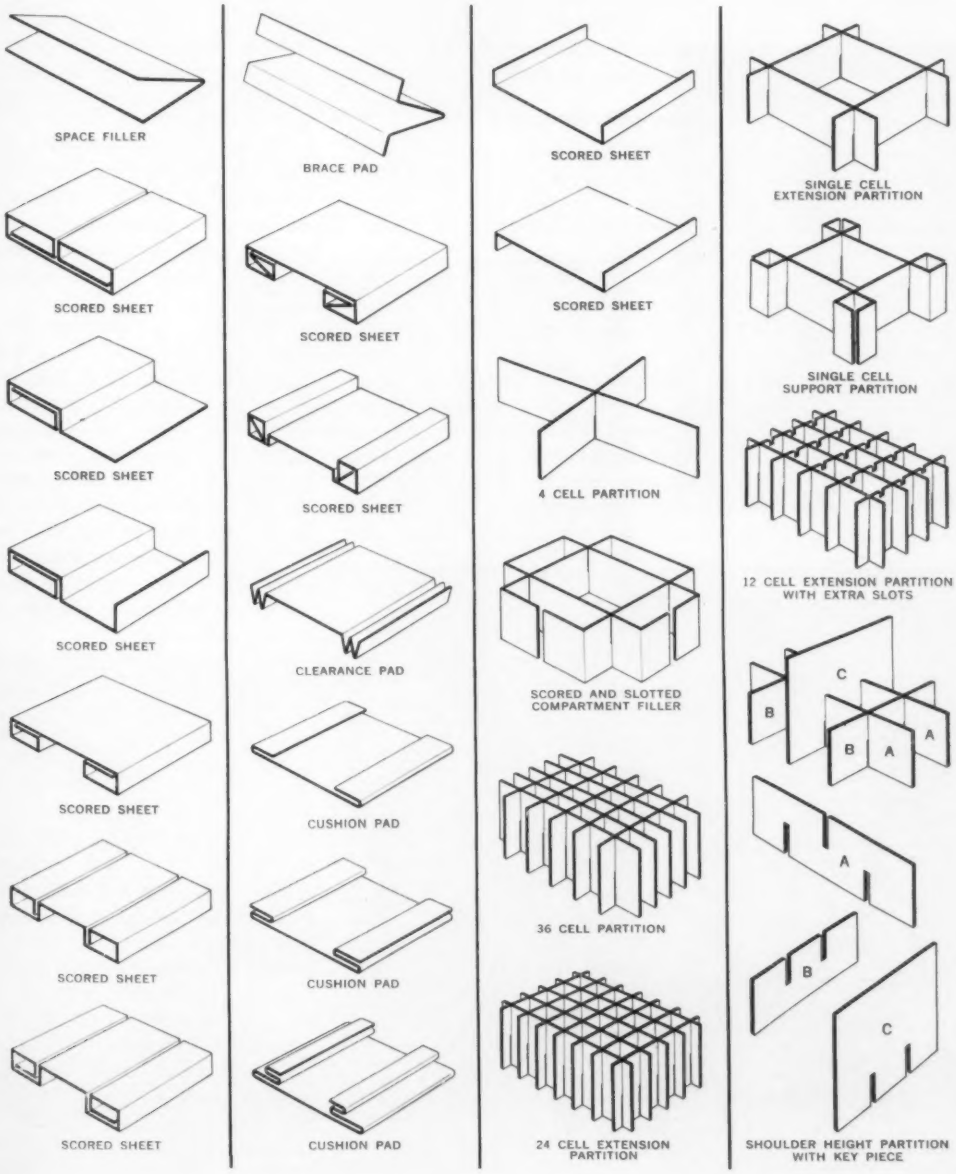
The next illustrated group of *liners* or shells including the open, joined and flanged liners, slotted trays and corner cut sheet or folder (columns 1 and 2), when inserted in boxes, add strength and reinforcement. These, too, can be used as separators or dividers.

The *die-cut inner packing forms* (columns 2 and 3) provide cushioning, suspension and retaining or anchoring sheets for fragile articles.

The next group of *scored* pads and *sheets* including cushion pads, brace pads, corner protectors and space fillers (columns 3, 4, 5, 6, 7) represents some of the more versatile of the interior packing pieces. Made in a variety of shapes, they are used for cushioning to provide air space, suspension and retention of products, and also for filling out the spaces created in a carton by odd-shaped articles.

The *partitions* or unit separators (columns 7 and 8) are made in many styles and shapes as shown in the illustrations, each adaptable for a particular purpose. These are used extensively for glass and automotive-parts packaging where multiples of products in high volume are packed.

There is much overlapping of advantages among the various styles and types of interior packaging elements. Therefore the product packaged and the manner of shipment should dictate the type of interior packing used.



FIBRE DRUMS

by Frank K. Duffy*

Fibre drums are straight-sided cylindrical and square-type (round corners-convex side) shipping packages of great strength which are light in tare weight and of many types of construction. Fibre drums originally were made (in 1920) to package dry bulk powdered materials requiring sift-proof and other particular protection. Now, many products are packed in these containers including metal parts, subassemblies, electronic equipment, semiliquids and liquids of a nonregulatory category.

Briefly summarized, from a strictly utilitarian standpoint, fibre drums have these characteristics: (1) cleanliness, durability and sanitation; (2) low tare weight; (3) easy opening, reclosing and sealing; (4) wide range of diameters and sizes; (5) water and moisture resistance, greaseproofness and (6) special construction for carrying many sensitive and dangerous products.

Fibre drums are classed by transportation authorities as such if the side walls are made from fibre—regardless of the type of material used in the top and bottom closures. The types of closures include: (1) fibre slip-on covers secured by gummed or pressure-sensitive tape; (2) metal tops and bottoms, secured with lever-actuated locking bands, or metal lugs or clips; (3) solid wood or plywood tops and bottoms, secured with lever-actuated locking bands and (4) ends of one material at the top and another material at the bottom.

Some 90% of the fibre drums approved for freight shipments are made with kraft linerboard. The convolutely wound sidewalls, referred to as continuously wound without joints, range from 0.012 to 0.016 in. thick. Finish and Mullen Test are specified to meet requirements of the products packed.

Sizes and strengths

Currently, industry standards provide for a range of fibre-drum sizes as follows:

Diameter: minimum, 8-in.; maximum, 23-in.

Capacity: minimum, 3/4-gal. or 173-cu. in.

Contents weight: maximum, 550-lbs.

For a deviation from these standards, or for special products, see Uniform Freight and Consolidated Freight Classification Package Description numbers, and the National Motor Freight Classification item numbers.

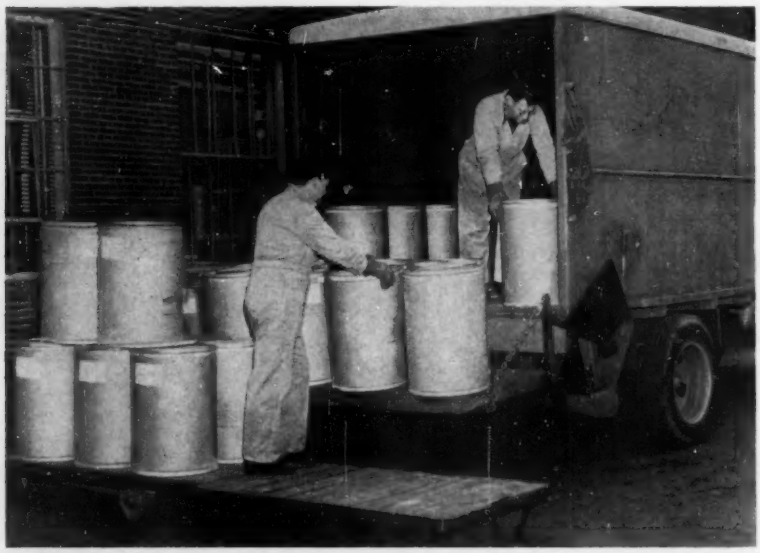
In making convolute-wound fibre drums, the number of plies (0.012-in. minimum thickness) is not necessarily determined by a combined thickness specification. The ultimate objective is: how much bursting strength per square inch is needed to meet or exceed the sidewall strength of the combined shell for the weight to be packed in the drum, or the capacity in gallons—whichever requirement is higher in terms of strength. Thus, with a 40-gal. drum made to carry 350 lbs., the sidewall minimum test must be at least 900 lbs., whereas a 40-gal. drum to carry 110 lbs. would require a minimum sidewall test of only 500 lbs. Fibre drums are built to exceed minimum strength specifications according to a self-imposed manufacturers' standard, particularly for products of high density. This is based on individual experience records of what is required for satisfactory performance.

According to specifications, the minimum sidewall test for a drum to carry 200 lbs. would be 700 lbs. per square inch. If the shipper expects to ship a part of the shipment overseas, then the drum manufacturer would recommend a drum built to carry 400 lbs. Thus the sidewall would be made of enough plies to test 900 lbs. or 1,000 lbs., and certain other changes would be made to add strength needed to withstand overseas transportation hazards.

Tops and bottoms

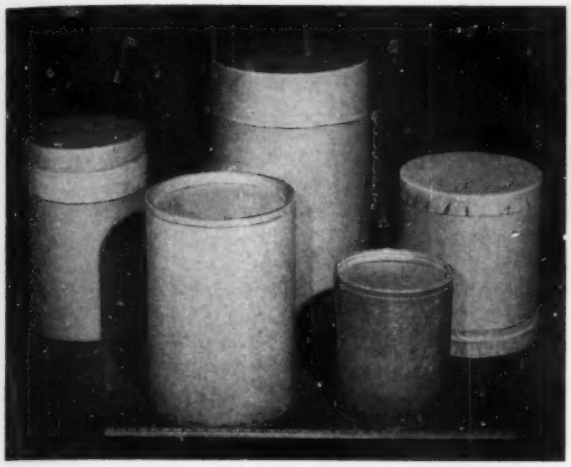
Fibre drum manufacturers have developed individual preferences and techniques for tops and bottoms. More than 95% of the fibre drums used today are made with full open tops—for easy filling and emptying. Regardless of whether the tops and bottoms are made of fibre, steel, solid wood or plywood, as authorized in specifications, close attention must be given constantly to producing parts which are uniformly accurate in dimensions and properly fabricated to secure strong, tight-fitting integration with the sidewall or chime. (Chime is that portion which extends beyond the top or bottom when the drum is made with recessed ends; otherwise it is the cir-

*Executive Assistant, The Greif Bros. Cooperage Corp., Lindenhurst, N. Y.

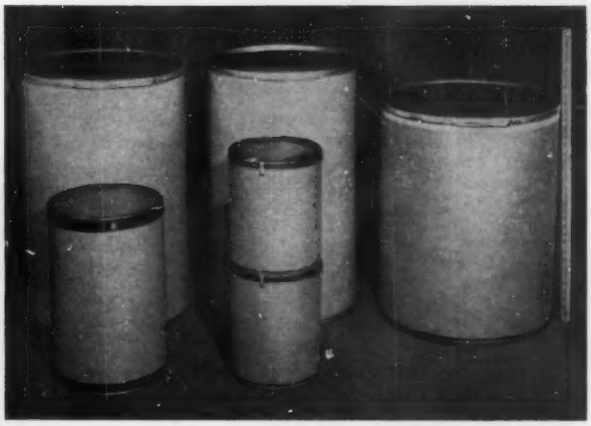


EFFICIENT HANDLING. Fibre drums are unloaded manually from truck equipped with elevator tail gate. Each drum contains 100 lbs. of vitamin mixture. (*Greif Bros. photo*)

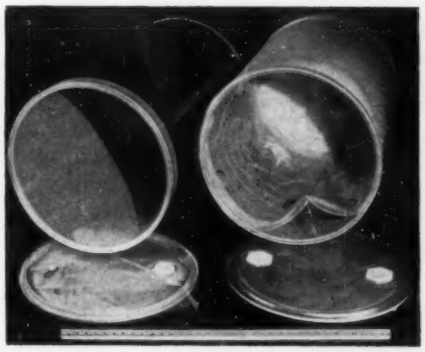
Some typical fibre drum styles and closures



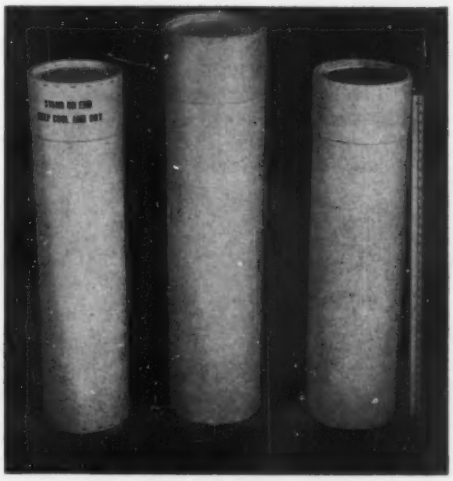
FIBRE TOPS AND BOTTOMS of typical drum styles can be sealed with tape. Recessed top and bottom styles can also be either stitched or stapled.



METAL-TOP-AND-BOTTOM drums may have lug closures (front row) or locking bands, or be tape sealed.



FOR LIQUIDS — 55-gallon drums with (left) a built-in polyethylene lining and (right) a removable liner. Standard fittings in cover are molded polyethylene.



ROLL MATERIALS are well protected for domestic or overseas delivery by the use of strongly constructed cylindrical drums.



COMBINATION drums include metal bottom, plywood top; reinforced fibre bottom, metal top; fibre bottom, metal-reinforced top.



WOOD OR PLYWOOD tops and bottoms: left—drum closed by lever-locking band; right—nails driven through band into wood.

cumferential edge at top and bottom of a drum.)

Since fibre drums have been used in recent years for many nonsifting products—such as rolls of X-ray and photographic film, rolls of barrier materials, electronic and metal parts and assemblies—it would be more realistic to confine the sift-proof requirement to drums for powders, flake crystals or granular materials. Thus a basic requirement is stated concisely in Uniform Freight Classification, Rule 41, Section 12(e), the National Motor Freight Classifications Rule 5, Section 8(h) (8)(e): "Tops and bottoms must be so fastened to sidewalls as to provide a tight seal and withstand ordinary handling and shipping without showing signs of sifting or loss of any contents. A similar wording of this requirement is stated in Federal Specification PPP-D-723—Drums, fibre. However, many products and industrial materials require airproofness and rust-proof inhibitors in fibre drums.

Closures and sealing disks

There are no detailed specifications regarding the type of closures that may be used. However, the following types of closures or fastening devices are in general use: metal bands, lugs, rings, clips, nails, wire staples or stitching, kraft-sealing tape, cloth-sealing tape, cloth-backed pressure-sensitive tape, adhesives, and several distinct types of metal locking bands.

Among the materials commonly used for sealing disks are plain kraft waxed or unwaxed; greaseproof papers; extensible kraft, single- or two-way stretch; various films. Sealing disks are a few inches greater in diameter than the drum to provide the desired amount of overhang around the perimeter. These disks serve in three ways: (1) as a protective barrier between the top and bottom of the drum and the content; (2) as a gasket to make a very tight seal and (3) as additional protection to prevent contamination of the contents.

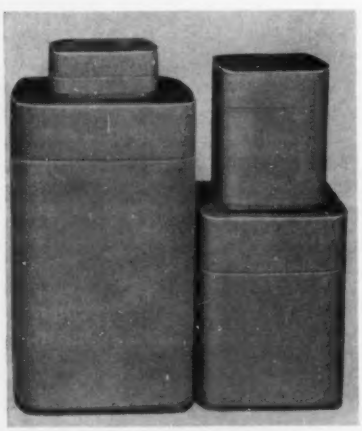
Hot-poured materials

Drums for hot-poured materials may be convolute-wound or lap-seam. Lap-seam drums, while not in general use for shipping dry and semisolid articles, have been used widely for hot-poured materials that solidify when cooled to ordinary shipping and storage temperatures. Federal Specification PPP-D-723, Grade D, Type 1, 11, 111, authorizes this construction for such solid materials. When used for products other than asphalt, the federal specifications require that the vertical seams shall be taped on the inside.

Drums for hot-poured products usually have an interior coating, referred to as "free-stripping treatment," which prevents the bonding of the fibreboard with the hot contents. Such drums do not require an "easy-to-open-and-reclose" feature since it is customary for the user to cut or chop the container open. In the group of hot-poured products that solidify on cooling are various asphalts, waxes, rosins and synthetic resins. The 55-gal. and the popular 100-lb. fibre drum are two of the most widely used. Some of these are authorized for weight limits higher than 550 lbs., and will be found in "Package Descriptions" of the Freight Classifications. Users of fibre drums for hot-poured products report two advantages: (1) there is less risk of workers suffering cut hands and other personal injuries and (2) fibre drums, after removal of contents, can be disposed of easily by burning.

Semiliquids and liquids

Revised Freight Classifications—Rail in 1960, Motor in 1961—as well as safety standards adopted by fibre drum manufacturers, require greater strength for packaging semiliquids than for dry products. Fibre drums now may be used for semiliquids up to 550-lb. and not over 75-gal. capacities—when built to comply with special construction and minimum strength—as the requirements for packaging semiliquids in fibre drums are higher than for dry products but not so high as for liquids. The term semiliquid is defined as referring to articles which have a minimum viscosity of 5,000 centipoises at temperatures up to 100 deg. F. exclusive of articles normally shipped under refrigeration, in which case viscosity shall be measured at shipping temperatures. When the article contains a solid material susceptible to phase separation, the viscosity measurement is determined on the liquid component when this is greater than 10% by weight.



SPACE SAVING square-shaped fibre drums excel in protection and strength characteristics; permit efficient handling, stacking and storage. (*Greif Bros. photo*)

When the freight regulation revisions were adopted for semiliquids, fibre drums for liquids were also approved for the shipment of nonregulatory liquids. The authorized types of constructions are described in Rule 41, Section 12 (g) for Rail Freight in supplement 15, Uniform Freight Classification 5, effective December 15, 1960, and for Motor Freight in Supplement 6, Motor Freight Classification No. A-5, effective March 16, 1961. Liquid drums under the rules of both freight (rail) and motor must comply with this test requirement: "Drums filled to net capacity with water must withstand without leakage a tip-over fall on the cover chime on solid concrete followed by a diagonal drop on the bottom chime sufficient to provide at least 500 foot-pounds impact except that maximum height of drop shall not exceed two feet and the minimum height of drop not less than one foot."

Under Rule 41, Section 12 (g), a new set of specifications has been set up by the Railroad and Motor Truck Carriers to cover requirements as to size, Mullen Test, gauge, etc., of fibre drums which will be used for the shipment of liquids. Under this new rule, the different types of fibre drums for liquids are indicated as Type 1A, Type 2A, Type 3A and Type 3B. These are the only types approved under the present carrier rules, and represent different types of plastic linings now available in the market. It is expected that the use of fibre drums for the shipment of both liquid and semiliquid products will expand rapidly under these new regulations—principally because of relatively low tare weight and low competitive costs.

Sensitive products

A substantial percentage of fibre drums is manufactured with a barrier material fabricated in the sidewalls, tops and bottoms for the protection of

sensitive products. Among the many popular and proven types of barriers are: asphalt between kraft; aluminum foil mounted on kraft; and lead foil, greaseproof papers, glassine, Pliofilm, vinyl, saran, polyethylene, polyester, polypropylene and similar materials. Many combinations are used, all dependent on the nature of the product packed and the requirements for extra protection.

To prevent penetration of product into the kraft sidewall interior, an appropriate type of inside coating or barrier material is used as an inner ply to be exposed to the contents; thus, the barrier is referred to as a lining. If water-moisture-vapor protection is desired, the barrier usually is placed within the middle section of the plies. Coatings may be used on either the exterior or the interior. These coatings may be applied by spray devices or other methods. Paints, lacquers, waxes, resins and plastics are used for either decorative purposes, product identification, or combinations of these functions. Silicate of soda often is used as an interior treatment. Treatments may be applied by brush, spray or dipping. Some treatments are actually coatings and others may be impregnations. For example, paraffin impregnation is one of the most common types of treatment. Free-stripping, as previously described, indicates a type of coating, lining or treatment used to prevent solid contents from adhering to the interior of the drum. To facilitate production of drums with some of the special coatings, linings or treatments, it is customary for the manufacturer to use drying ovens, light tunnels or other means of artificial drying.

Dangerous articles

Special types of containers are required for certain explosives and chemicals, such as poisonous insecticides. For complete information see Agent T. C. George's Tariff No. 13 which is applicable to rail freight and rail express, or Motor Carriers Explosives and Dangerous Articles Tariff. The two tariffs are almost identical and are based on Interstate Commerce Commission "Regulations for Transportation of Explosives and Other Dangerous Articles by Rail Freight, Motor Freight and by Water." Fibre drums are covered by Specifications 21A and 21B. At present the maximum capacity authorized is 55 gals. and the maximum weight is 225 lbs. The sidewalls must be convolutely wound; the plies must be secured together with adhesive and each ply must be at least 0.012-in. thick. Each drum manufacturer is required to register his specification with the Bureau of Explosives, 60 Vesey St., New York 7, N. Y. Changes in construction (drum and closure) differing from specifications thus filed must be approved by the Bureau of Explosives before authorized for use.

Performance tests

Rail Freight Classification Rule 41, Section 12, and Motor Freight Classification Rule 5, Section 8, establish minimum construction specifications but have no pre-test for drums for dry or solid articles or semiliquids. Fibre drums for liquids "must be able to withstand two drops from a height of 2 ft., one on chime at bottom and one on top on a solid concrete floor. After test, drums must stand for a period of 24 hours each on each end without leakage or serious rupture."

Dangerous Articles ICC Specification 21A and 21B tests include drop tests and compression tests and these usually are made under the supervision of a representative of the Bureau of Explosives. Samples, selected at random, are filled with dry, finely powdered material to authorized net weight, and must withstand the tests without leakage or serious rupture. No single drum shall be expected to withstand more than the test prescribed in either Specification 21A or 21B.

The insulating properties of fibre drums generally are regarded as a favorable factor in product-quality control. Technologists have observed that the fibre drum retards fluctuation in temperature and holds it to a narrower range—an important consideration for many types of products. Approved methods are authorized and available.

Loading and handling

Fibre drums should be stacked vertically—not on their sides. They usually are handled by pallets, by lift trucks or by manual labor. The American Association of Railroads publishes an illustrated booklet, "Recommended Methods of Loading Large Straight-Sided Fibre Drums," which may be obtained from their Freight Loading and Container Section, 59 E. Van Buren St., Chicago 5.

Nested drums may be of various capacities such as 5-, 10- and 20-gal.; or they may be of the same capacity but different diameters. Nesting provides an economy in loading—almost doubling the number of drums in a box car, motor truck or warehouse.



EASY METHOD of inserting polyethylene liner in fibre drum. Liner is pulled from perforated roll over mandrel and is torn from roll. Mandrel and liner are inverted in drum. Mandrel is removed and top of liner is cuffed. (*Bemis Bro. photo*)

General

Most regulations require that every fibre drum must bear a "Certificate of Maker" stating the sidewall test pounds per square inch, the net weight limit in pounds, and the maker's name and address. Shipping charges are at the same rate in fibre drums as in barrels, unless otherwise provided in the tariffs. Fibre drums of a given diameter and height have uniform tare weights—so that labels, shipping stencil data, production records and invoicing are all simplified. This is an advantage over other types of bulk containers where weighing and marking is an individual process. Fibre drums in general are "tailor-made" for the product to be packed. Not only are specifications written to take care of the special characteristics of sensitive products, but sizes are selected to fit products of various density, with a minimum waste of space. Thus the diameter ranges of 8-in. to 23-in., and the heights from 3-in. to 42-in. or greater, permit the user an unusual freedom in selecting drums for his products. This also allows the user to save valuable space in warehouses, trucks, box cars and cargo planes.

HEAVY-DUTY BAGS

by D. O. Maylath*

Through constant efforts by bag manufacturers and users to utilize newly developed materials and modifications in constructions, an increasing variety of products is finding its way into low-cost, lightweight, space-saving heavy-duty bags. Also, polyethylene and other plastic liners opened new advantages for packagers in shipment of acids, alkalies and other hard-to-package materials. Some all-polyethylene bags of 7- to 10-mil gauge are used to ship chemicals.

Coatings and laminations, of late, provide increased protection for products requiring special barriers. Newer bag shapes and auxiliary machinery make better palletization possible. For example, a squared-up, box-shaped construction—particularly suited for shipping two, five or ten retail bags of flour, sugar and so forth—affords safe stacking. Bag-flattening machines can level shipping sacks containing dry, free-flowing materials for higher, more secure stacking. Special units were developed to palletize bags automatically. Improved closures permit easy opening. These containers for bulk shipment offer ease in handling and storage, simplicity in filling and closing, and low tare weight.

Not to be overlooked is the merchandising aspect. Bags offer an excellent means of promoting a company name, brand or trademark and provide surfaces on which to identify contents and give use instructions.

No exact line of separation can be drawn between what is referred to as a heavy-duty bag and a normal-duty bag for shipping bulk products. In a sense, practically all bulk-size shipping sacks are heavy-duty, because they are specifically designed to carry the specific product safely under normal shipping conditions.

Any distinction must be arbitrary and, in this article, any bulk shipping sack designed to carry 50 lbs. or more is considered a heavy-duty package. Some bags, however, are designed to carry particularly hard-to-pack products or to meet unusually rigorous shipping conditions. These are the extra-strength bags.

*Advertising Department, Bemis Bro. Bag Co., St. Louis, Mo.

Heavy-duty bags fall generally into three broad classifications: paper, textile and laminated-textile bags.

Multiwall paper shipping sacks

There are two distinct types of paper shipping sacks: light-duty—constructed from one or two plies of paper, used largely for consumer-size packaging; and heavy-duty—known as "multiwall" bags, made of three to six plies of paper and used largely for bulk shipments. Distinguishing, among multiwall bags, between light- and heavy-duty types is particularly difficult; with so many different constructions and such a variety of built-in qualities no classification is practical.

Multiwall paper shipping sacks are custom-made. They rarely are manufactured and stored in stock types and sizes because each product has its own requirements. With few exceptions, each is designed and manufactured for a specific packaging job.

Paper shipping sacks generally are constructed of paper in basis weights ranging from 40 to 60 lbs. Heavier weights are more common with extensible paper. Less commonly, 30- and 70-lb. plies are used for special purposes. The basis weight of paper is figured from the weight of 3,000 sq. ft., or one ream or 500 sheets of paper 24 by 36 in. A ream of 50-lb. (basis weight) paper would therefore weigh 50 pounds.

The type of paper used contains long fibres properly interlaced for maximum balanced strength and durability. This paper is distinguished from other krafts by its name (shipping-sack kraft) and is available in white, natural or other colors.

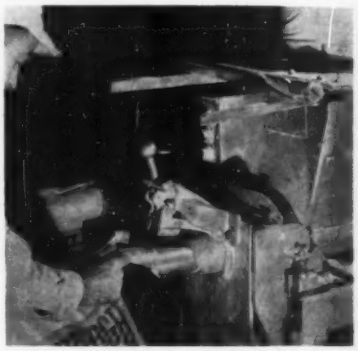
Different weights of paper frequently are combined in one multiwall bag. Special krafts like waxed, asphalt-laminated or asphalt-impregnated, wet-strength or polyethylene-coated types are included in the multiwall construction as a separate ply or plies for certain protective requirements. Other specialty papers, films and sheets may be used as an inner ply or liner, or protective sheets of this type may be laminated to kraft.

A paper-processing development has produced for bags an extensible paper better able to withstand the stresses and strains of shipment than regular kraft. In surface appearance, it resembles regular multiwall kraft but will stretch about 10% and thus better absorb the impact shocks common in handling and shipping. Ordinarily, kraft has a stretch of only 1½ to 2%. With the extensible paper, fewer but heavier plies that add up to a decrease in total basis weight of paper can be used. Controlled tests of actual shipments during recent years indicate that a reduction of 20% or more in basis weight can be achieved through use of extensible paper for many products. The most successful application is in the cement industry. Here, the most popular construction is a three-wall pasted valve bag.

Another development is an antiskid sheet for the bag's outer ply. The nonslip quality, obtained through application of an antiskid agent to the surface of natural kraft during paper-



QUICK OPENING for sewn open-mouth and sewn valve bags. Pull tab frees sewing thread. Partial opening of bag can form pouring spout. (*Bemis Bro. photo*)



COST SAVING and throwaway convenience gained in use of sewn-top multiwall (five-ply) 50-lb. kraft bags for fumeric acid. Filling is on semi-automatic valve packer, adjustable to drums. (*St. Regis photo*)

making, reduces slippage of stored or palletized loads.

A loose polyethylene intermediate ply is replacing, to some extent, other protective barriers. The film's comparative flexibility is an advantage especially in cold weather—it does not become brittle. The seamless polyethylene tube as an inner ply has possibilities but is still experimental.

Due to the flexibility of polyethylene, some bag users feel this type sleeve affords a more positive valve closure than sleeves made from natural kraft or extensible kraft paper.

Basic types

Five major types of multiwall construction are available: sewn valve, sewn open-mouth, pasted valve, pasted open-mouth and automatic.

Sewn valve bags are closed at top and bottom by sewing with a reinforcing tape. A valve opening in one corner provides for filling. Special valve-filling equipment is necessary for these bags. The valve may be any of several types, depending on the product. Some valve styles have flaps, extended inner or outer sleeves, etc.

The *sewn open-mouth bag* has the bottom formed by sewing through reinforcing tape. The mouth is left open for filling. After filling, the top is usually sewn closed, although wire ties, glue, staples and gummed tape may be used for closures. This bag is normally gusseted. Recently, a quick-opening, tear tab closure was introduced. Bags for feed, fertilizer, grain and salt can be opened without damage, increasing the bag's value for secondary use.

The *pasted valve bag* is made by forming satchel folds at top and bottom and pasting. A valve opening is left in one corner. Characteristics and filling requirements are essentially the same as for the sewn valve bag.

The *pasted open-mouth bag* is made in flat tube form with a pasted satchel bottom. Its most important use is as a baler for shipping 2-, 5- or 10-lb. retail-size bags of sugar, flour, and the like. It is generally pasted or closed with tape. The top also can be closed with a wire tie and, less commonly, twine ties, staples or sewing. Many milling firms discovered that balers cut master container costs by as much as 50%.

The *automatic bag* (SOS, or self-opening style) differs from the pasted open-mouth bag in that it is gusseted and has a factory-made square-type pasted bottom. Top closure is made after filling by sewing, tying, stapling, taping or gluing.

Types of closures

Sewn closure. The simple, sewn-top closure is used when there is no particular problem of sifting or of loss or absorption of moisture.

Tape under sewing (TUS). The tape, either creped or flat kraft, adds strength and resistance to sifting. It is bound over the bag's top edge. Normally, a TUS closure includes a filler cord of creped paper or soft cotton which tends to fill the needle holes and minimize sifting.

Tape over sewing (TOS). This is an economical method assuring a virtually siftproof result, since the tape seals the needle holes and prevents loss of even the most powdery contents through the stitched closure. Most tapes are self-adhering.

Plain valve. A plain valve closure is held closed by the bulk of the materials enclosed. It is used where slight leakage is permissible.

Inner sleeve valve. A paper extension, or sleeve, extends inward for some inches, further sealing the closure and minimizing sifting.

Tuck-in sleeve valve. The valve extends outward from the valve opening in the bag. After filling, the sleeve must be tucked in manually. In some cases, the sleeve must be polyethylene-coated so it can be heat-seal closed before being tucked in. This provides a positive seal against sifting and water-vapor gain or loss.



WETPACK produce bag. Open mesh, woven from twisted yarn, is laminated to sheet of perforated polyethylene which allows circulation of cold water and of air. (*Chase Bag photo*)

The *wire-tied closure,* used for open-mouth bags when the packed product is such that it will not sift or when nominal sifting is permissible, is applied with a hand tool. Normally it is used for low-speed packing.

There are numerous variations on the fundamental types of multiwall bags. For example, there is the sewn open-corner bag, made like a sewn valve bag except that, instead of a valve, one corner is left unsewn to provide an opening for filling. The corner usually is closed by stapling. This is a special-purpose bag for materials such as tar or asphalt that are packed in semiliquid form and then harden as they cool.

Also, there is a single-gusset sewn-valve multiwall. The bag, difficult to distinguish from the traditional two-gusset bag when filled, contains additional usable space created by the flat tube side. The innovation provides more room for product flow during the filling operation and reduces blow-outs. Extra space created by the flat tube side often permits use of a shorter bag—hence its economy.

An important variant in multiwall shipping-sack construction, relatively new, is the reinforced-end bag. Strengthening strips of kraft are added and spot-pasted between plies at each end of the bag. Most multiwall-bag breakage (other than that caused by snags, tears, punctures, etc.) occurs at the ends of filled bags. End reinforcement strips provide added strength where failures are most likely.

This special feature can find one of two applications. It can supply additional strength at less expense than adding an entire additional ply of paper to the bag, or it can reduce costs by eliminating one ply of paper and substituting heavy reinforcing strips for necessary strength. Neither application is universally practical, or even possible, for all products.

Another construction feature, introduced here from Europe, is the "stepped-end" pasted valve multiwall bag—distinguished by a staggering arrangement of plies resulting in overlapping or shingling at satchel ends so individual plies are pasted together. Bag manufacturers claim advantages of softer ends and greater flexibility.

A variation of the stepped-end is the stepped-corner feature, also made on pasted valve bags. Here only the corners are overlapped or shingled. By stepping all four corners of a bag, valve leakage or seepage from the cor-

ner opposite the valve is eliminated and leakage, in general, reduced.

Other features in multiwalls, for special conditions, include special paste patterns, wax-dipped ends, reinforced bottoms, ventilation holes.

One outstanding example of a special construction is the laminated crinkled-kraft bag, having from two to six plies of creped-kraft paper sometimes called "secondary stretch paper." These plies are loosely bonded together with adhesive. The strength and stretch of the material enable the bag to withstand severe stress.

While not in a heavy-duty category themselves, plastic liners (notably polyethylene) are coming into wide use for shipping products in bags, drums, boxes, cartons and other containers. (See also article on p. 701.)

Representative heavy-duty bag constructions

*Construction**	*Purpose or characteristics*
Single-wall, double-wall and multiwall (3, 4, 5 and 6 walls of shipping-sack kraft) plain or coated or laminated	For agricultural and food products, chemicals, drugs, various building materials, and minerals
Plain or creped kraft laminated to burlap or cotton with plasticized adhesive	Designed to withstand extreme high-low temperature ranges
Plain or creped kraft, asphalt laminant, burlap	Provides bag that has strength and protects against moisture and sifting
Multiwall kraft with parchment, glassine or other grease-resistant plies	For packaging products with fat content, such as pet foods
Foil, polyethylene, kraft	Moisture, odor and gas barrier protection
Polyethylene-coated paper	L nt-free moisture protection
Polyethylene laminated to burlap or cotton with colorless adhesive	Moisture protection; inert to acids and alkalies
Pliofilm lam nated to burlap or cotton	For water- and oil-resistant bags
Cellophane-textile	For products with high fat content

*Asphalt is a commonly used laminant—it is low cost and is a good moisture barrier. Other laminants include latex, polyvinyl acetate, polyethylene and vegetable glues.
N.B.—When describing lamination construction, the inner ply is named first, then the others in order, from the inside to the outside.

Paper open-mesh bags

Brief mention should be made of the bulk-size open-mesh bags made of yarns twisted from a special type of paper known as "spinning kraft," and used for bulk shipment of vegetables, generally 50 lbs. to the bag.

The tightly twisted kraft is highly resistant to abrasion. In addition to affording ventilation and product visibility, the bags' standard colors were carefully developed to enhance the appearance of the contents.

When necessary, shipping-size, open-mesh bags are treated for wet pack so they withstand icing in trucks and refrigerator cars. This type is popular for packing products requiring ventilation; they are the accepted standard package for shipping onions.

Textile bags

The two principal textiles used for heavy-duty bags are burlap and cotton. Burlap is manufactured in various weights, commonly designated as either lightweight or heavyweight. Lightweight burlaps fall into the heavy-duty classification as established here, while heavyweights fall into the extra-strength category.

Burlap constructions are designated according to the weight of the goods in a given width. For example, 40-in., 10-oz. burlap refers to a piece of cloth woven 40 in. wide and weighing 10 oz. per running yard. Regardless of the actual width of the cloth, the expressed weight is based on what the weight would be if the cloth were woven 40 in. wide. Thus, 36-in., 10-oz. burlap weighs less than 10 oz. to a running yard 36 in. wide but weighs 10 oz. in a 40-in. width. This is usually indicated by expressing actual width and basis weight plus basis width, so that a 36-in., 10-oz./40-in. burlap is burlap woven 36 in. wide which weighs 10 oz. per running yard of 40-in. material. This distinction is not always made in this country, but is important in foreign trade where the 40-in. basis width is not observed.

Lightweight burlaps range from 7- to 9-oz. basis weights; 9½- to 14-oz. burlaps are classed as heavyweights.

Burlap has exceptional strength, is highly tear- and snag-resistant, and withstands weathering well. It is available in special finishes, such as chested, cropped and mangled.

Cotton bags are of widely different constructions but usually are concentrated in sheetings, Osnaburgs, print cloths, cambrics and percales. Many can be called heavy-duty bags, but only the heavier Osnaburgs can really qualify as extra-strength bags.

Cotton constructions are designated differently than the burlap types. Weights are expressed in terms of the running yardage, in the actual width loomed per pound. A 36-in., 2.35-yd. Osnaburg would, therefore, refer to a piece of Osnaburg woven 36 in. wide and measuring 2.35 running yd. per pound of weight.

Sheeting of the 40-in. 3.75-yd. and 40-in., 3.60-yd. bags are used to carry 100 lbs. of feed—and 37-in., 4.00-yd. or 36-in., 2.85-yd. for 100 lbs. of flour. Principal constructions in Osnaburg are the 40-in., 1.76-yd. bag, carrying up to 200 lbs. of flour for export; 40-in., 2.11-yd.; 36-in., 2.35-yd.; 32-in., 2.65-yd.; and 2-bu. seamless bags for seeds, sugar, starch and the like.

Waterproof bags

Maximum heavy-duty protection is furnished by the waterproof laminated-textile bag, in which a layer of stretchable paper or plastic film is bonded to burlap or cotton fabric. Three to five layers are usual. As a rule, the textile layer gives strength and the laminating and inner layers add special protective features.

Inner ply or plies of a waterproof bag are made from a wide variety of materials, according to protection needed. It can be laminated polyethylene film, Pliofilm, rubber-coated, a polethylene-coated paper, or a special or treated paper. Some bags are made with paper both inside and out and a burlap layer sandwiched between. Printing surface is improved. Also, handling crews, thinking them paper, treat them more gently.

Waterproof bags also protect products against contamination, insect infestation, loss of aroma, absorption of undesirable odors, change in moisture content, and loss of contents from snagging and tearing. Some waterproof paper-lined bags (WPPL) can be made lintproof, acid-resistant, grease- or oil-resistant when required.

Steel drums and pails

by Livingston Keplinger*

Creation of new and increasing markets for steel drums and pails is resulting from substantial growth of chemical, petro-chemical, atomic-energy and other new industries—plus an increased production volume of the petroleum, paint, varnish and food industries. Approximately 100 million units now are produced annually in 80-odd plants. Too, a sizable quantity of the containers is bought by Government and the armed services.

Currently, industry research is concentrated on improved container design and construction to permit use of lighter gauges, standardization of dimensions and development of new and more efficient linings. Collectively these improvements tend to increase the high safety factor of the steel drum and pail and also lead to important reductions in packaging costs.

Steel shipping containers are divided into two basic groups—drums and pails—and are of various types, such as single trip or re-usable, heavy or light, tight or full-removable head and lined or unlined, for shipping regulatory or nonregulatory products.

The industry defines a *drum* as any single-walled, cylindrical or bilged container having a capacity of over 12 gals. inclusive, constructed of steel sheet and inclusive of all gauges.

A *pail* is defined as any shipping container with or without bail and handle, having a capacity of 1 to 12 gals. inclusive, constructed of steel sheet 29-gauge or heavier.

In specifying the thickness of steel used in containers, manufacturers use the Manufacturers' Standard Gauge Table—a weight-thickness gauge table.

The accompanying table of more commonly used gauges gives corresponding thicknesses. Higher gauge numbers denote thinner sections.

Gauge number	*Thickness, inches*	*Gauge number*	*Thickness, inches*
12	0.1046	19	0.0418
13	0.0897	20	0.0359
14	0.0747	22	0.0299
15	0.0673	24	0.0239
16	0.0598	26	0.0179
17	0.0538	28	0.0149
18	0.0478	29	0.0135

All steel shipping containers are made in accordance with the specification requirements of either the Interstate Commerce Commission, if they are to carry "regulatory" (dangerous) products, or the railroads' Classification Committees' Rule 40, or Rule 260 of the National Motor Freight Classification, if they are to carry "nonregulatory" products (products not classified as dangerous).

ICC specifications, based upon best information available and usually substantiated by tests, provide containers for the safe transportation of explosives and other dangerous (regulatory) products. They are revised from time to time and are kept in workable order by the Bureau of Explosives of the Association of American Railroads.

Shipping regulations and specifications covering authorized shipping containers for all regulatory products are contained in Tariff No. 13, ICC Regulations, issued by the Bureau of Explosives, New York.

ICC regulations specify types of containers in which products must be shipped, and containers are identified and referred to by the number of the specification authorizing their manufacture, such as ICC-5, ICC-17E, etc.

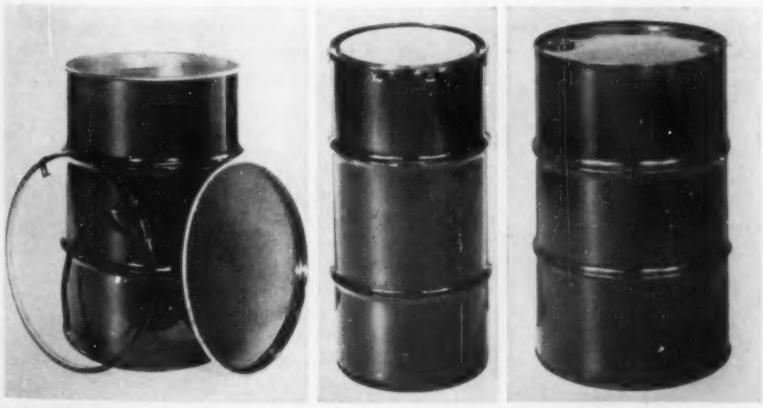
In general, corrosive products, such as acids, require an ICC-5A container. Flammables with a flash point below 20 deg. F. require an ICC-5 container, and flammables with a flash point from 20 to 80 deg. F. require an ICC-5B container. All these specifications cover the returnable (re-usable) and heavy steel shipping container.

Other specifications, such as ICC-17E, cover light steel shipping containers and nonreturnable (single-trip) containers. The latter cannot be used again as shipping containers for any regulatory product, once the contents have been removed following initial shipment, without a special permit from the Bureau of Explosives.

In general, liquid products are shipped in tight-head containers which usually are provided with threaded or screw-type openings. This is always true for highly flammable products like gasoline and almost invariably for less-flammable products, such as kerosene, etc. Dry and semiliquid products are shipped in open-top or removable-head containers.

Tight-head containers are equipped with two standard openings, one of 2-in. diameter, the other of ¾-in. diameter. Certain drums used primarily in the chemical industry also have a 2-in. diameter side opening.

When designed for shipping dry and semiliquid products, drums may be fitted with full-removable heads,



BASIC STYLES OF DRUMS illustrated above are, left to right: 55-gal., full-removable head; 120-lb. grease; and a 55-gal., tight-head drum. Steel drums, by definition, have a capacity of more than 12 gallons.

* President, Steel Shipping Container Institute, New York City.

Light shipping drums

Type	Capacity range, gals.	Gauge
Rule 40	13-75	24-16
Grease[1]	14-55	24-18
Grease	100-120 lbs.	24-20
Open top[2]	13-75	24-16
Agitator type	30 and 57	19-18
ICC-17C[3]	13-55	18-16
ICC-17E[4]	13-55	20-18
ICC-17H[5]	30 and 55	18
ICC-17X[4]	30 and 55	19-18
ICC-37 series[3]	13-55	26-22

1 Bolted or crimp covers; 2 bolted or lever-locked covers; 3 tight or full-removable heads; 4 tight heads only; 5 full-removable heads only.

which are retained by bolted or lever-type closing rings. In smaller containers, such as the grease drum or 5-gal. pail, removable heads are usually retained by a series of lugs around the periphery.

The 55-, 30-, 15-, and 5-gal. containers and the 120-lb. grease drum account for not less than 95% of all steel shipping containers produced.

The 55-gal., ICC-5A drum is made of 14-gauge steel, equipped with 1 by 1¾-in. I-bar rolling hoops and provided with a specially threaded flange and plug. This drum is used for the shipment of acids, most commonly sulphuric acid, and weighs approximately 112 pounds.

The 55-gal., ICC-5 drum may be made of 14-gauge steel with corrugated or expanded rolling hoops, or of 16-gauge steel, in which case it is equipped with ¾ by 1¼-in. I-bar rolling hoops. Each of these drums weighs about 90 pounds. Another drum made and used as an ICC-5 shipping container is the 55-gal., 14-gauge drum equipped with ¾ by 1¼-in. I-bar rolling hoops and weighing about 107 pounds. These three ICC-5 drums are all used for the shipment of flammable liquids having flash points below 20 deg. F., such as gasoline.

The 55-gal., ICC-5B drum is made of 16-gauge steel with the rolling hoops expanded or rolled into the shell. Nominal weight of this drum is about 68.5 lbs.; it is used for shipping flammable liquids having flash points between 20 and 80 deg. F., such as alcohol and lacquer thinners.

Generally, the heavier ICC drums are returnable and have chimes reinforced by separate rings rolled on container.

The nonreturnable, 55-gal., ICC-17E drum is authorized for the shipment of flammable liquids, such as antifreeze alcohol, the flash point of which is 20 to 80 deg. F. The 55-gal., Rule 260 and Rule 40 drum is authorized for the shipment of nonregulatory products, such as lubricating oils, salad oils and paints. Both these drums are made of 18-gauge steel, having rolling hoops expanded into the shell and nonreinforced chimes. The Rule 260 and Rule 40 drum is also made in full-removable-head style for the shipment of dry or semiliquid products. The nominal weight of the tight-head drum is 48.5 lbs., and full-removable-head, 51 lbs.

The 120-lb., 20- or 22-gauge grease drum is also a Rule 40 container with rolling hoops expanded or rolled into the shell. The nominal weights of these two containers are 16.7 and 13.9 lbs., respectively.

Heavy shipping drums

Type	Capacity range, gals.	Gauge
ICC-5[1]	13-110	18-13
ICC-5A	13-110	16-12
ICC-5B[1]	13-110	20-13
ICC-6A[1]	13-55	14-12
ICC-6B[1]	13-110	16-12
ICC-6C[1]	13-110	18-14
ICC-6J[1]	13-55	19-15
ICC-6K[1]	55	18

1 Available in either tight-head or full-removable-head styles.

The two most popular 5-gal pails are made of 24- and 26-gauge steel. They may be designed plain or with one or two beads expanded into the shell. Under American Standards Association specifications, the tight-head pail is plain and the lug-cover pail is provided with a single bead. Some of these pails are made for the shipment of regulatory products under ICC specifications (for example, ICC-17E and ICC-37A). Others are made under Rule 40 for nonregulatory products. The nominal weight for the ASA 24-gauge tight-head pail is 5.2 lbs.; for the lug-cover pail the nominal weight is 5.4 lbs.

Steel shipping pails

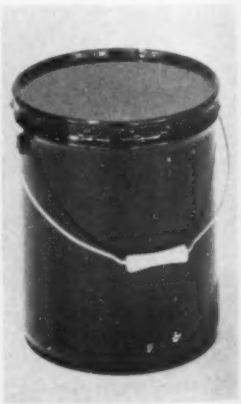
Type	Capacity range, gals.	Gauge
Lug-cover pails	1-12	
Ring-closure pails	1-12	
ICC-5[2]	1-12	22-14
ICC-5B[2]	1-12	24-20
ICC-5C[2]	1-12	20
ICC-17C[2]	1-12	24-18
ICC-17E[2]	1-12	24-19
ICC-17H[1,4]	1-12	24-18
ICC-37 series[2]	1-12	28-24
Ink pails[4]		
Putty pails[4]		

1 Covers, 20-gauge for 5 gals. and less; 2 tight or full-removable heads; 3 tight heads only; 4 full-removable heads only.

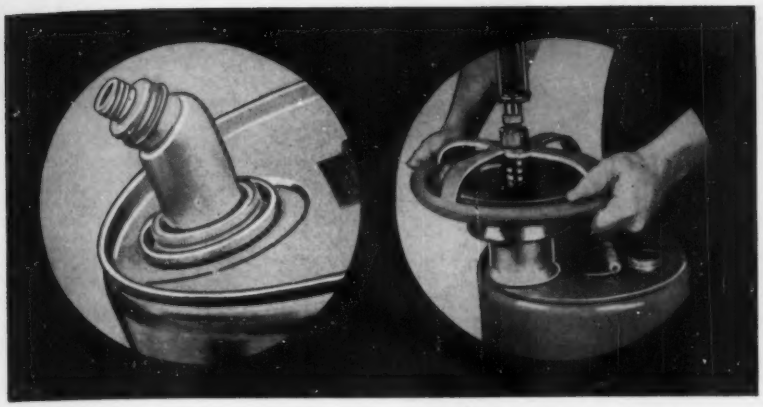
The Steel Shipping Container Institute is cooperating with customer industries in developing voluntary standard specifications for several types of containers. The purpose of these voluntary standards, which are gaining wide acceptance here and abroad, is to reduce wide variations in container design specifications to help improve filling, handling and shipping; at the same time, it expedites shipment of orders from the manufacturers of new containers.

Listed below are 14 of these speci-





BASIC STYLES OF PAILS. Left—5-gal. tight head; right—5-gal. lug cover. Steel pails range in capacity from one to 12 gal., constructed of sheet steel 29 gauge or heavier. Special dispensing-type closures, and bails and handles, can be specified.



PACKAGER-APPLIED NOZZLES for pails and drums are new convenience aids that simplify use of container. Reversible spout assembly (left) comes with light metal seals and is applied to pail after filling. (*American Flange & Mfg. Co. photo*)

fications which have been approved and published by the American Standards Association:

55-gal.: MH2.1—tight-head drum (ICC-17E); MH2.2—full-removable-head drum; MH2.3—tight-head drum (ICC-5B); MH2.4—tight-head drum (ICC-17C); MH2.5—full-removable-head drum (ICC-17H).

30-gal.: MH2.6—tight-head drum (ICC-17E).

16-gal.: MH2.7—tight-head drum (ICC-17E); MH2.8—full-removable-head, lug-cover drum.

5-gal.: MH2.9—tight-head pail (ICC-17E); MH2.10—lug-cover pail (ICC-37A-80).

57-gal.: MH2.11—full-removable-head drum.

30-gal.: MH2.12—full-removable-head drum.

30-gal.: MH2.13—full-removable-head drum (ICC-17H).

16-gal.: MH2.14—full-removable-head drum.

Linings and coatings

Interior treatments. The rapid development of organic coatings by the industry has resulted in a widespread use of lined containers. Where only a negligible amount of containers was lacquer-lined a decade ago, 25% of all steel shipping containers now have linings of one type or another.

The extensive research program which has been conducted by the Steel Shipping Container Institute at Battelle Memorial Institute over the past 13 years has proved that phenolics, vinyls, epoxys, polyamids, polysulfides and various blends are highly effective as linings against many products. This has resulted in the development of Synthetasine 100, Synthetasine 200 and Synthetasine 300, improved linings for hard-to-package materials.

Commercially available lining materials are being evaluated constantly at Battelle Memorial Institute, and currently a great deal of effort is being devoted to developing improved methods of application and heavier single-coat films.

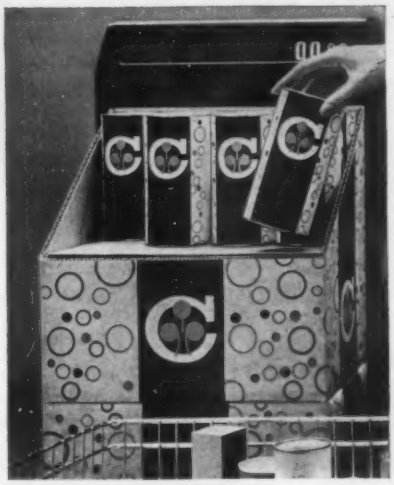
Sprayed and roller-coated linings are most prevalent, but separate polyethylene liners for which steel shipping containers are protecting overpacks are finding more general use.

Where spray-applied, roller-coated or separate linings are not required for product and/or container protection, there are available rust-inhibitive systems that effectively protect interior surfaces of unlined containers during normal in-process storage.

Exterior treatments. Though the rust-inhibiting process of phosphatizing is not new, its application to steel shipping containers is of comparatively recent date. It is generally felt that the best results are obtained by phosphatizing scale-free steel. The process of treatment results in conversion of the treated steel at the surface to a coating of fine and tightly adherent zinc-iron, water-insoluble, phosphate crystals.

The rust-preventive qualities of phosphate coatings inhibit to a high degree the spreading or creeping of rust from any scratch or abrasion to areas under undisturbed paint, thus restricting surface injury to the area actually damaged. Having a degree of porosity, phosphate coatings provide an excellent bond for paint, lacquer

Corrugated Containers



TURN TO SECTION 3

Page 103

Learn how International Paper's pastel Gator-Hide® kraft linerboards enable you to get sales appeal in your corrugated shipping container.

INTERNATIONAL PAPER

JIFFY PADDED SHIPPING BAGS



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and other such finishes. Phosphatizing is required at present for all drums delivered to the armed services.

By reason of their being attractively painted in pleasing colors, steel shipping containers were early recognized as an excellent advertising medium. Their effectiveness is greatly improved by adding trademarks, brand names, point-of-use sales messages, etc., applied by stencils, decals, labels, silk screening and lithography.

Recent developments

Without doubt, the development of interior linings has done more than any other single development to make secure the over-all usefulness and dependability of the steel shipping container. While continuing its research program on linings, the Steel Shipping Container Institute is presently conducting (also at Battelle) an extensive study on the basic design and functional features of steel shipping containers in an endeavor to use steel of lighter gauges and thus provide American industry with new opportunities for economy coupled with the dependable safety characteristic of new steel shipping containers.

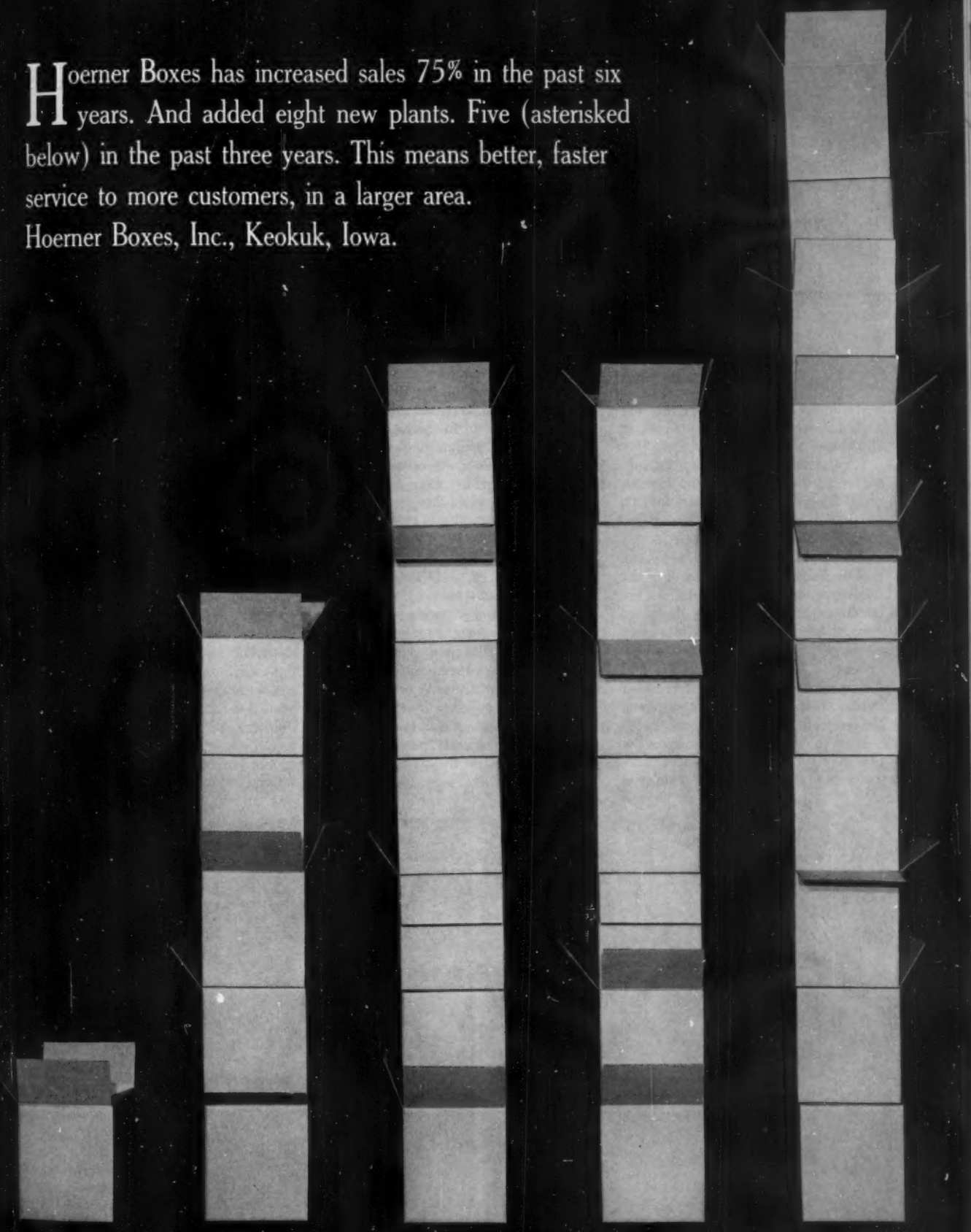
Becoming increasingly popular for shipment of certain less hazardous, regulatory products are the ICC-17E, combination 20/18-gauge, 55-gal. and the all-20-gauge, 30-gal., tight-head drums. These same drums are authorized for shipment of nonregulatory products under Rules 260 and 40 as full equivalents of the all-18-gauge, 55-gal. and all-19-gauge, 30-gal. drums. Efforts are now being made to secure authorization under Rules 260 and 40 of the full-removable-head, 55-gal., 20/18-gauge and 30-gal., 20-gauge drums.

Another comparatively recent development is the composite steel drum with polyethylene liner covered by ICC Specification 37P, which is authorized for the shipment of certain regulatory products, such as battery acid electrolyte. Two new specifications—ICC-6D and ICC-37M—proposed by the Bureau of Explosives will permit use of steel containers as overpacks with separate polyethylene liners for other regulatory products.

Filling has been speeded up by use of subsurface filling equipment and this, in turn, has led to the use of the clinch-on-type closure.

Advantages of reductions in handling are being gained by increased use of pallet loads and fork trucks.

Hoerner Boxes has increased sales 75% in the past six years. And added eight new plants. Five (asterisked below) in the past three years. This means better, faster service to more customers, in a larger area.
Hoerner Boxes, Inc., Keokuk, Iowa.



Fort Smith and Little Rock, Arkansas; Danville and Waukegan-Gurnee, Illinois*; Des Moines, Keokuk and Ottumwa, Iowa; Minneapolis, Minnesota; Tupelo, Mississippi*; Springfield, Missouri*; Sand Springs, Oklahoma; Sioux Falls, South Dakota; Mission* and Fort Worth, Texas. Hoerner's linerboard mill: Missoula, Montana.

Steel strapping

by H. D. Connell*

Shipping and materials-handling specialists use strapping in seven areas of packaging applications: (1) to reinforce shipping containers; (2) to bale compressible materials; (3) to bundle multiples of an item into a single unit for manual handling; (4) to serve as a closure for containers of special design; (5) to palletize or unitize for handling by mechanical equipment; (6) to suspend, tie down and support in interior packaging; (7) to brace or secure lading for carload shipments of goods.

Reinforcement. Steel strapping provides added protection for the contents of all types of shipping containers. It is applied either with tensioning and sealing tools or by nailing.

A "rule of thumb" for determining the desirable strapping size for the reinforcement of most wood and fibre boxes is that the total breaking strength of all straps should equal 10 times the gross weight of the package. Otherwise, the number of straps and their placement are to be determined by size, shape and construction of the box as well as the nature and value of the load which is being carried.

Baling. Considerable savings in space and increased ease of handling are made possible by baling such items as textiles, clothing, hides, rayon staple and sulphite pulp. Baling with strapping reduces cubic displacement of compressible materials, often resulting in a decrease in shipping costs particularly for water transport.

Bundling. One of the functions of steel strapping is performed in the bundling process. In many cases, the entire weight load is carried by the strapping. Little or no protective material is needed. Bundling reduces the cost of handling, counting and recording. By bundling and strapping a number of smaller units into one package, application of shipping labels may be reduced and both shipping and storage costs lowered.

Closure. Steel strapping affords a strong, pilfer-resistant closure for no-nail-cover wood boxes, regular fibreboard slotted containers, fibreboard boxes of the telescope type and those with covers extending over the sides. Strapping is also used in the assembly of authorized special packages. For example, furniture is frequently packaged with a base frame of wood, a double-face corrugated-board wrap-around and cap. The assembled package is then strapped.

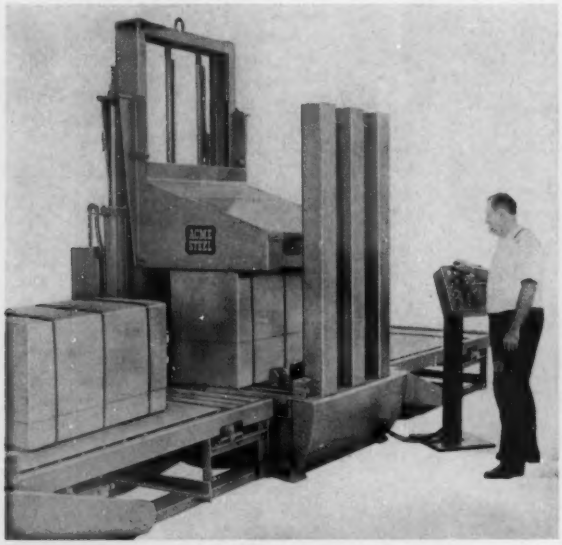
Palletizing or unitizing. Products may be unitized with or without pallets and skids. Unitizing is essentially bundling as discussed above, but is considered here primarily as bundling for mechanical handling.

Steel strapping is an economical, safe and strong method of retaining products on skids and pallets. The strapping is easily applied with suitable tension for maximum protection.

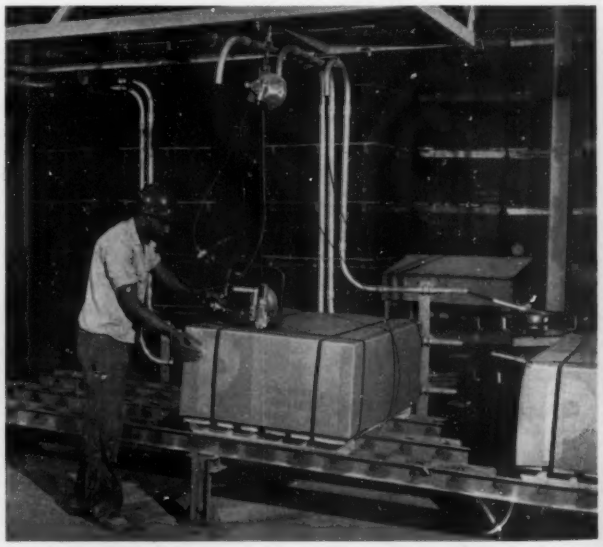
Suspension, tie down and support. Steel strapping is also used for such functions as internal bracing, fastening accessory items, suspension packaging, fastening of insulation materials and anchorage of packing materials.

Car bracing. Larger sizes or heavier cross sections of steel strapping are used to brace or secure lading for shipments moving in closed or in open-top railway cars to one or more consignees. There are two principal methods: the full-floating method of car bracing which utilizes the principle of securely binding car ladings into two or more units, depending on the type

*Sales Manager, Acme Steel Productions Div., Acme Steel Co., Chicago



AUTOMATIC compression strapping machine enables four units a minute to be strapped easily by one man. Units are conveyed into machine and three straps applied while packages are compressed. (*All photos these pages, Acme Steel*)



CROSS STRAPPING. Here one set of straps is applied with a steel strapper. As the package moves along the conveyor, cross straps suspended from overhead and secured to the conveyor are draped around the package and applied.

of shipments, and the anchored-load method which employs steel strapping to brace or secure ladings as fixed loads. The strapping is threaded through and wrapped around anchor plates. In turn, the anchor plates are securely nailed to either car wall posts or to the car floors.

Strapping is available in flat or round types. Flat steel strapping usually is furnished in widths from ¼ to 2 in. and in thicknesses from 0.010 to 0.065 inch. Punched strapping and strapping with profiled cross section is available for specific uses. Round steel strapping ranges in size from 19½ gauge to 8 gauge, and is not to be considered as common wire, since in most cases it contains a high carbon content. Steel strapping is furnished with organic or metallic coatings. Nonferrous strapping also can be obtained for special applications. (See chart on packaging tapes. p. 200.) All types of strapping are available in either coils or cut lengths.

Nailless steel strapping. This is the most popular variety of steel strapping and is tempered for application with tensioning and sealing tools. Can be either punched or unpunched.

Nail-on steel strapping. Nail-on strapping serves to strengthen and protect and add to the carrying ability of wood boxes and crates. It is supplied in the softer tempers, either punched or unpunched.

Special steel strapping. Colored and printed steel strapping can be used for brand and product identification and also as added deterrents to pilferage.



COMBINATION of steel strapping and open-type crates used in preparing heavy motor blocks for shipment saves shipping costs and without sacrificing protection.

Strapping with rolled edges or turned edges and with heavy galvanized coating serves as a permanent reinforcement to increase the life of re-usable boxes and crates, such as beverage boxes, field boxes and tote boxes. The crown of the profile or rolled-edge strapping acts as a runner to facilitate the movement of the container. Rolled-edge variety is provided with edges turned under to add further to container strength. Flat strapping is also available with the extra-strength double-edge feature.

The ends of tensioned steel strapping are joined to effect a sealed joint by using a separate seal, by spot welding, by twist tying or by notching.

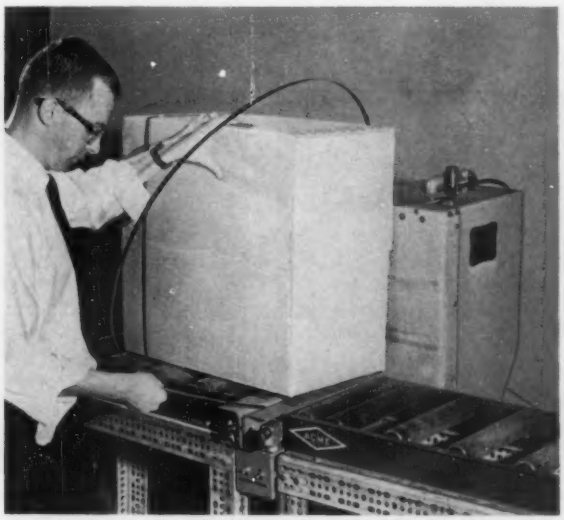
There are many kinds of seals for use with all widths and thicknesses of strapping. They are of two general styles: the open type which snaps over the strapping and the closed type which is threaded on prior to tensioning. Seal types are selected on the basis of strapping applications and tensioning and sealing tools used.

Tools and accessories are available for all types of strapping applications. They range from simple hand tools to fully automatic strapping machines.

Included are separate tensioning and sealing tools; combination tools (combining tensioning, sealing and cutting functions in one tool); pneumatic, hydraulic and electric tensioning tools; semi-automatic and automatic strapping machines which deliver measured tension.



TENSIONING, strap-cutting and spot welding of strap ends are possible with this automatic strapping machine. Unit is designed to reduce crating and shipping costs.



VERSATILE, compact, 75-lb. strapping machine handles most jobs, strapping various package sizes and shapes. It is easily adapted to desired degree of automation.

Plastic shipping containers

by C. A. Speas*

Performance and protection of public safety are the key words in any consideration of industrial shipping containers, and these two considerations must be satisfied before evaluating other characteristics. This is especially true of regulated products where failure of the container in storage, transit or use can be very costly. For this reason the Interstate Commerce Commission issues specifications to cover containers used for shipment of hazardous commodities. One of the most recent is ICC Specification 2U, written for plastic containers. For polyethylene containers, the Specifications set forth minimum thicknesses of 0.010 in. in a five-gal. container and 0.015 in. in a 15-gal. unit. Specification 2U also defines over-all performance requirements of plastic containers including adequate resistance to shipping abuse. Specifications related to various plastic shipping containers are shown in the chart on p. 699.

What are some of the major requirements sought in plastic industrial containers? They are:

1. Inert, stable material
2. Low cost
3. Low cube, light weight
4. Nonbreakability
5. Wall of adequate minimum thickness, free from defects
6. Compact shape
7. Leakproof, tamperproof closure system with adequate size openings for filling and dispensing
8. Adaptability to commercial fillers
9. Available dispensing accessories.

Realizing these requirements, container manufacturers have developed their designs to achieve the most efficient use of available plastic resins (generally one of the regular or high-density polyethylene resins). With the development of appropriate forming methods, a large variety of containers has resulted. The forming methods include blow molding, thermoforming, injection molding, combination injection-blow molding and many others.

If the chemical is one which has not had proven use with the polyethylene resin to be used in the container, care should be taken to determine the adequacy of a proposed new container regardless of construction. Listed below are three important characteristics which should be studied before deciding on a given application.

1. *Chemical resistance.* Though polyethylene is one of the most chemically inert plastics, there are certain liquids that will attack it or soften it appreciably. For example, polyethylene is attacked by concentrated oxidizing acids and it is softened by aromatic and chlorinated hydrocarbons, especially at elevated temperatures.

2. *Permeation.* Polyethylene has a measurable transmission rate for all liquids and gases. For certain applications the loss of liquid or vapor is beyond acceptable limits. Often this difficulty can be eliminated by choice of polyethylene resin, such as one of the higher-density types.

3. *Stress cracking.* In the presence of certain surface active liquids (wetting agents) polyethylene may fail in a locally stressed area. This usually can be prevented by choice of resin or by elimination of stressed areas in the design of the container. "Holding tests," in which the liquid is kept stored in the container for an appropriate period, are recommended if there is any question concerning the commodity. The tests may be conducted at room temperature but often are conducted at an elevated temperature (say 125 deg. F.) since failure normally can be accelerated by higher temperature.

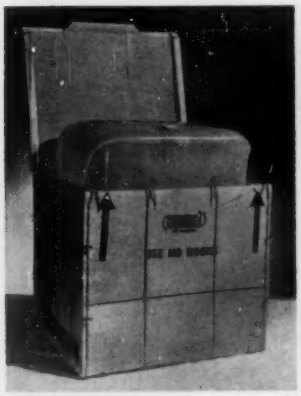
Self-supporting, rigid containers

Shipping containers currently available for industrial liquids are:

1. Self-supporting, rigid types
2. Semirigid composite types.

Blow-molded bottles. To date, polyethylene has been the predominant resin used for these containers. During the past few years, the introduction of high-density polyethylene resins has further increased the versatility of the containers available. Why does polyethylene occupy such an exclusive position here? Why not

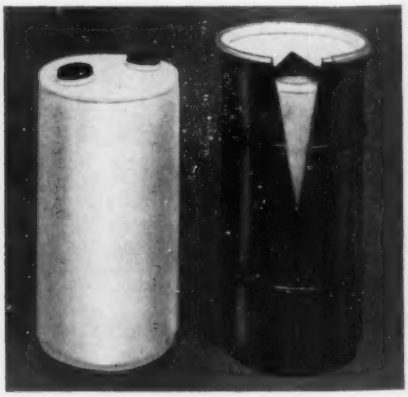
*Chief Engineer, Hedwin Corp., Baltimore, Md.



FIFTEEN-GALLON shipper conforms to ICC 2U and 16A; is designed for rugged handling, outdoor storage. (*Hedwin photo*)



POLYETHYLENE BOTTLES in a range of sizes are shown with different outer packs that can be used. The 5-gal. Firestone package, foreground, conforms to ICC 2U. (*Plax photo*)



MOLDED POLYETHYLENE DRUM designed to fit steel, fibre or wooden overpack is available in range of sizes. Inner drum is one piece. (*Delaware Barrel & Drum photo*)

Basic types of plastic shipping containers*

CARBOYS — RIGID OR SELF-SUPPORTING CONSTRUCTIONS

Inner container					Overpack													Major uses
					Nailed wood			Steel drums			Plywood			Wirebound				
Capacity in gals.	ICC spec.	STC or returnable	Min. wall inches	Nominal weight pounds	ICC spec.	Gross tare lbs.	Cube cu.ft.	ICC spec.	Gross tare lbs.	Cube cu.ft.	ICC spec.	Gross tare lbs.	Cube cu.ft.	ICC spec.	Gross tare lbs.	Cube cu.ft.	Closure[3]	
5	2T	RC	.0625	3.5	22C	12.0	1.65	1H[1]	17	1.8	15P	15.5	1.6	16D	15	1.9	SC	
6½	2T	RC	.0625	4.5	22C	16.0	2.4	1H[1]	22	2.3	15P	17	1.9	16D	18	2.3	SC	
13	2T	RC	.0625	8.75	22C	27.5	4.2	37A	27	3.2	15P	29	3.4	16D	21[2]	3.0[2]	SC	
5	2TL	RC/STC	.015	1.0	22C	9.5	1.65	37A	8	1.2	15P	13	1.6	16D	8.3	1.4	SC	
14	2TL	RC	.050	5.75	22C	24.5	4.2	37A	24	3.2	15P	26	3.4	16D	18[2]	3.0[2]	SC	

DRUMS — RIGID OR SELF-SUPPORTING CONSTRUCTIONS

Inner container					Overpack										Major uses
					Fibre drums			Steel drums			Wirebound				
Capacity in gals.	ICC spec.	STC or returnable	Min. wall inches	Nominal weight pounds	ICC spec.	Gross tare lbs.	Cube cu.ft.	ICC spec.	Gross tare lbs.	Cube cu.ft.	ICC spec.	Gross tare lbs	Cube cu.ft.	Closure[3]	
5	2S	RC/STC	.0625	1.4	21BP	5.0	1.1	5B, 37A	7.5	1.3	16D	8.0	1.3	PL, SC	Heavy duty for chemicals, industrial solutions. Hazardous products: acids and corrosives, flammables not otherwise specified (N.O.S.); Class B poisons; liquid oxidizing materials.
15	2S	RC	.0625	3.5	21BP	11.8	3.4	5B, 6J, 37A	16 to 23	3.3	16D	17.5	3.3	PL, SC	
30	2S	RC	.0625	5.5	21BP	19.5	6.2	5B, 6J, 37A	26 to 38	6.3	16D	31.5	6.5	PL, SC	
55	2S	RC	.0625	9.0	21BP	30.8	11.3	5B, 6J, 37A	36 to 74	11.6	16D	62.0	12.0	PL, SC	
15	2SL	RC/STC	.0300	2.3	21BP	10.5	3.4	5B, 6J, 37A	14 to 18	3.5	16D	16.3	3.3	PL, SC	
30	2SL	RC/STC	.0300	3.3	21BP	17.8	6.2	5B, 6J, 37A	25 to 36	6.3	16D	29.8	6.5	PL, SC	
55	2SL	RC/STC	.0400	5.3	21BP	27.0	11.3	5B, 6J, 37A	36 to 65	11.6	16D	58.3	12.0	PL, SC	

SEMIRIGID CONSTRUCTIONS

Inner container					Overpack													Major uses
					Corrugated			Fibre drums			Steel drums			Wirebound				
Capacity in gals.	ICC spec.	STC or returnable	Min. wall inches	Nominal weight pounds	ICC spec.	Gross tare lbs.	Cube cu.ft.	ICC spec.	Gross tare lbs.	Cube cu.ft.	ICC spec.	Gross tare lbs.	Cube cu.ft.	ICC spec.	Gross tare lbs.	Cube cu.ft.	Closure[3]	
5	2U/37P	STC	.010	0.5	12B	2	1.0	21BP	3	1.0	37P	5.5	1.3	16A	6.5	1.0	FS, HS, PL, SC	Hazardous products: acids, flammables, etc. Low cost, cube and tare. Easy handling.
15	2U/37P	STC	.015	1 & 1.5	12B	5	2.5	21BP	10	3.0	37P	15.5	3.0	16A	12.5	3.2	FOH, FS, PL, SC	
30		STC	.008	1.8	—	—	—		16	6.3		28.0	6.3	—	—	—	FOH	
55		STC	.008	2.5	—	—	—		26	10.4		43.0	10.4	—	—	—	FOH	

* This list is representative of the many types of containers available. It is based on responses to a questionnaire sent to manufacturers of plastic containers. For more complete information see the list of manufacturers in the Buyers' Directory under the headings *Carboys* and *Drums and Barrels, Plastic*. Also see the article "Film Liners for Shipping Containers," p. 701. The principal suppliers of information for this chart were: Carboys — Plax; Drums — Delaware Barrel & Drum; Semirigid — Jones & Laughlin and Hedwin Corp. There is, however, some overlapping of types.

[1] This specification is for a steel crate.

[2] These data for cylindrical shape. Rectangular box is also used.

[3] Closure and filling opening size: FOH — Full open head HS — Heat seal FS — Flexspout 2⅜ in. PL — Plug 38 mm. SC — Screw cap 38 mm,. 53 mm., or 83 mm.

vinyls, polyesters, fluorocarbons or nylon? The answer is given in the ease of fabrication, in raw material cost and in combined physical and chemical characteristics of polyethylene.

The earliest (and still commonly used) rigid industrial containers in plastic were the 13-gal. heavy duty carboys.[1] The ICC Specifications are 1F, 1G and 1H. Weighing 8¾ lbs. and having a minimum sidewall thickness of 1/16 in., the bottle is overpacked in wood or corrugated boxes, plywood or steel drums, and steel wire frames. It is sufficiently rugged to be re-used like conventional glass carboys, but with distinct advantage in weight reduction and resistance to breakage. More recently new, lightweight, non-returnable types of 1-gal. and 5-gal. self-supporting polyethylene bottles have appeared.

[1] Manufactured by Plax Corporation.

Semirigid, composite containers

This is a relatively new class of container in which the plastic part of the package is formed of adequate thickness and shape to safely contain the liquid with the "supporting" and handling strength furnished by a fibreboard carton, steel pail or wirebound wood box. It is generally aimed at applications that favor a "one-way" or "single trip" container to eliminate the problems of return freight reconditioning and deposits associated with the multitrip container.

Why use more than one component? There are two basic reasons:

1. With the required strength and rigidity supplied by less expensive fibreboard, wood or steel overwrap, the plastic part can be designed to the minimum thickness required for adequately containing the liquid. This contributes to the economy of the package since fibreboard, wood and steel are, strength-wise, more economical than polyethylene.

2. Features required for safe and

convenient shipment, storage and handling can be designed into the fibreboard, wood or steel component more practically and economically than into the plastic component. Here we include such features as stacking strength, puncture resistance and resistance to abuse imposed by dropping, shipping and handling.

Blow molded liners. This type of container has become so prominent during recent years that ICC specifications have been written to cover the plastic component. A prominent composite container of this type is the blow-molded polyethylene inner lining for steel pails and drums (ICC 37P).[2] The container is available in 1-, 5- and 15-gal. sizes.

Thermoformed cubes. Another application of polyethylene to the composite type package is the thermoformed cube used with corrugated, fibreboard and wirebound wood overpacks.[3] The container consists of a regular density (0.92) inner cube within a protective corrugated or fibreboard carton or wirebound wood box. The cube wall has an average thickness of 0.015-0.032 in. (depending on the capacity and model) and a corresponding minimum thickness of 0.007-0.016 inches.

The 1-gal. cube is available in regular and heavy-duty models for use with corrugated fibreboard, 200-lb. test, standard type construction; or water-resistant MR board or V3C board. Similar models are available in Imperial-gal. and 2½-gal. sizes.

The 5-gal. cube also is available in two weights for use with double-wall corrugated fibreboard 350- or 500-lb. test; or wirebound wood box with corrugated liner. A five Imperial-gal. cube is also produced.

The 15-gal. cube is manufactured in a single weight for use with a wirebound wood box with corrugated liner.

Drum liners. Polyethylene drum liners of the self-supporting, rigid type have been described previously. There also are semirigid types used in conjunction with steel or fibre drums. One of these is the STC (single trip).

A second type, also used with steel or fibre drums in 30- and 55-gal. capacities, is molded in such a way that the material is heavy where high stresses occur in shipping and handling and is thinner where high strength is not required. Models are available in open and sealed heads, the latter with dispenser fittings.

Closures

The self-supporting plastic container has normally employed a screw-cap closure. For example, the blow-molded plastic bottles have threaded necks for a variety of screw-cap sizes and types. The molded polyethylene drum uses a threaded plug similar to the conventional metal closure for steel drums, or one of a variety of special types of closures.

Certain of the semirigid, composite containers with a plastic inner component have not been so readily adaptable to conventional integral threaded closures. The blow-molded liner for the 5-gal. steel pail uses a dispenser-type closure that is crimped onto a preformed hole in the top of the molded unit and supported by the top of the outer component of the composite unit.

The cube container uses a pouring spout, projecting from the top, front edge. The spout (a flat oval in cross section) is heat sealed and folded back under the carton during shipment. The user cuts off the heat seal at front end of the spout and can tuck the spout back under the carton flaps when not in use. A simple plastic reclosure clip is available to slip across the end of the spout. The cube also can use threaded closures.

The probe method of dispensing has proved successful for various applications of the cube package. A rigid plastic spike forced into the side of the plastic package ducts the liquid to a rubber tube through which the contents can be dispersed. Controlled dispensing results—particularly desirable for products such as battery acid, brake fluid, etc.

Polyethylene drums

by Jerome S. Heisler*

An important type of rigid, self-supporting plastic container is the 5- to 55-gal. polyethylene drum. A combination injection molding-blow molding technique produces the drum in one piece.

These drums are available in 5-, 15-, 30-, and 55-gal. sizes, and are made in two wall thicknesses—a heavy wall and light wall. Both the heavy wall and light wall can be used for returnable service and the light wall also is used extensively as a one-way container. These drums are intended for use with steel, fibre or wire-bound wooden overpacks. Basic types and sizes are listed on p. 699.

The heavy-duty, returnable drum (0.0625-in. min.) has been designated by the Interstate Commerce Commission as the ICC-2S and the light wall returnable drum (0.040-in. min.) has been designated as the ICC-2SL. Both are approved, in general, for all corrosive liquids that will not attack polyethylene. The ICC-2S drum is also approved by the Armed Forces for both domestic and export shipments of regulated and nonregulated commodities under MIL-D-40030A.

The light wall (ICC-2SL) polyethylene drum, by a closure change, is sufficiently low cost to be used as an STC (single trip) unit when placed inside steel drums (18 gauge or lighter) or fibre drums. This package has full ICC approval.

Because polyethylene drums are used for many different types of applications, a variety of drum closures has been developed. Today there are 17 styles available—from internal plugs to external caps including pressure-release caps and plugs. All standard drum handling, filling and emptying equipment will fit the polyethylene drum closures.

With the advent of the polyethylene drum, the chemical field has an opportunity to find new economies and performance advantages for certain products, particularly where breakage, freight rates, high deposits, product purity and tare weights are now a problem.

Perhaps one of the most striking examples of how polyethylene drums save money for the industry is demonstrated by the following:

One 55-gal. polyethylene-steel drum, 18 gauge, weighs 65 lbs. and the cost is $24.00. It has 11.7 cu. ft. displacement. Four 13-gal. glass carboys (to equal one 55-gal. polyethylene drum) weigh 300 pounds. Cost is $60.00. The four carboys displace 15.6 cubic feet. With a 55-gal. polyethylene drum there is one filling and only one handling; it requires one-fourth the maintenance and represents a lower capital investment. A carboy, plastic or glass, receives a first-class freight rate. A drum receives a third-class rate—about a 40% saving.

2 This container, the "Jaliner," is produced by Jones & Laughlin Steel Company with inner component blow-molded from polyethylene by Plax. Closures used are Rieke Flexspout and Poly-Grip.
3 Cubitainer produced by Hedwin Corp.

* Vice President, Delaware Barrel & Drum Co., Wilmington, Del.

Film liners for shipping containers

by Jerry Dorfman*

Both economy and efficiency in the packaging and the shipment of products in various types of shipping containers are gaining ground through expanded and improved uses of film liners. In general, the liners permit the use of lighter weight, less expensive shipping containers and, in addition, afford excellent protection as well as advantages in handling and use of packaged products.

Polyethylene is still the most widely used film for this purpose, but new materials are being developed constantly. Specially formulated heavy gauge polyvinyl chloride liners are used with critical chemicals and for storage of such materials as bleaching compounds, plating chemicals, etc. These liners have great tensile strength and a temperature range of minus 25 deg. F. to plus 230 deg. F. Polyester films and polypropylene both offer superior chemical resistance and strength factors as well as wide temperature ranges before distortion. The polyester film gives excellent protection where extra strength and resistance to oils are required. Polypropylene is resistant to almost all chemicals and has a use temperature of 300 deg. F. (See chart "Properties of Packaging Films," p. 131.) A limited quantity of liners is being manufactured from this material but, as the production of polypropylene increases, its use for liners will gain momentum.

The variety of container sizes and shapes presents no problem for film liners. They can be made to fit into any container.

For use in drums, two popular shapes are the round-bottom and the straight-bottom. The round-bottom liners eliminate "dog-ears," wrinkling and air pockets. They are easier to insert and fit better. If these factors are not important in a shipping operation, the less expensive straight-bottom liners can be used.

Square-bottom liners are made for corrugated boxes and cartons. They also are made to any specified size or thickness.

Three basic closure types of film liners are available: (1) the tie-off, which must be long enough to twist and tie; (2) the peel-over, with which a separate disk-top is supplied and (3) the spout type, with flexible round, flat or conical sleeve spouts as integral parts, for a high degree of safety in pouring and for nonmetallic contact where required.

Liners can be sewed, heat sealed, stapled, tied, labeled and printed.

The economy of using the liners must be judged by weighing the various factors. For example, while a polyethylene liner for a 55-gal. drum costs 20 to 40 cents (depending on its gauge), this cost may be offset by economies in shipping and handling such as the use of less expensive and lighter-weight primary containers, the enlarged re-use value of the containers, protection of product, reduction of waste.

A practical development in both economy and efficiency is the production of polyethylene liners, as well as bags, on a continuous roll of material, with perforations between each one so they are easily detached from the roll (the bags are sealed to the correct size). Kept on the roll, they are uncontaminated and clean. Also, they contribute to ease of handling, economy in storage space, better inventory controls, and price economies which mean that additional uses of polyethylene for liners will be found to be practical.



ROUND BOTTOM polyethylene liner is shown here expanded and being inserted into drum. *(Protective Lining Corp. photo)*

Correct size. Liner must not be too short or too narrow and it never should have to be stretched to hold the product.

Absolute seal. Seal must not have skipped spaces and should not be easy to pull apart. There should be as little extruded "leading edge" on either side of seal as possible; too much leading edge can weaken the liner and seal by as much as 50%.

Film gauge. It is important that the gauge be thick enough to hold contents of package efficiently and safely. Following is a general reference on the correct thickness (in inches) required:

Nonhygroscopic powders and solids —0.0015 or 0.002 gauge.

Pastes, viscous liquids, hygroscopic powders, solids, gels—0.0025 or 0.003 gauge.

Liquids, foods, very hygroscopic powders—0.004, 0.005 or 0.006 gauge.

*President, Protective Lining Corp., Brooklyn, N.Y.

Typical steel drum and liner sizes

Steel drum size			*Round-bottom liner*		*Straight-bottom liner*	
Capacity, gal.	*Interior diameter, in.*	*Interior height, in.*	*Tie-off type, in.*	*Peel-over type, in.*	*Tie-off type, in.*	*Peel-over type, in.*
5	11¼	13⅜	19x22	19x15 with 14 disk cover	19x30	19x22 with 14 disk cover
15	15⅝	19¼	26x33	26x23 with 18 disk cover	26x42	26x31 with 18 disk cover
30	18¼	26⅜	30x44	30x30 with 21 disk cover	30x54	30x40 with 21 disk cover
55	22¾	32⅝	38x53	38x39 with 26 disk cover	38x65	38x52 with 26 disk cover

Sources of shipping regulations

Carrier[1]	*Publication*	*Available from*	*Over-all controlling body*
Truck	"Motor Carriers' Explosives and Dangerous Articles Tariff No. 10," $5. "National Motor Freight Classification No. A-5" and supplements, $7.	American Trucking Assns., 1616 F St., N. W., Washington 6, D. C.	Interstate Commerce Commission. Control is under Commission's "Code of Federal Regulations, Title 49—Transportation Parts 71-78" (available from Supt. of Documents, U. S. Government Printing Office, Washington 25, D. C., $6.25; 1959 supplement, $1.) and utilizes the services of Bureau of Explosives (Assn. of American Railroads). The Tariff Code and all supplements for a three-year period are also available from the Bureau of Explosives, 63 Vesey St., New York 7, N. Y., as "T. C. George's Tarriffs."
Rail Freight	"Consolidated Freight Classification" and "Uniform Freight Classification," $4.75	Official Classification Committee, 1 Park Ave., New York 16, N. Y.	
Rail Express	"Official Express Classification," no charge	Tariff Mailing Bureau, Railway Express Agency, 219 East 42 St., New York 17, N. Y.	
Waterway Freight	Intercoastal Freight Tariffs	Thomas J. Callanan, Chairman, 80 Broad St., New York 4, N. Y.	
	Coast Guard Regulations in Agent T. C. George's Tariff No. 12	T. C. George, Agent, 63 Vesey St., New York 7, N. Y.	
Export	"Exporters' Encyclopaedia" (issued annually); Complete Export Shipping Guide (with Special Bulletins issued semi-monthly), $40	Exporters' Encyclopaedia, 20 Vesey St., New York 7, N. Y.	Bureau of Foreign Commerce, U. S. Dept. of Commerce, Washington 25, D. C.
Air Cargo and Air Freight	"Civil Aeronautics Manual 49 --Transportation of Explosives and Other Dangerous Articles," 20 cents	Supt. of Documents, Government Printing Office, Washington 25, D. C.	Federal Aviation Agency
	Yearly: Official Air Freight Tariff, 4 manuals, $10; Official Air Transport Restricted Articles Tariff No. 6-C, $3.25; Official Air Cargo Tariff Circular No. 1-A, $2.50; Official Air Freight Specific Commodity Tariff No. 7-A, $2.50	B. H. Smith, Agent, Air Traffic Conference of America, Div. of Air Transport Assn. of America, 1000 Connecticut Ave., N.W., Washington 6, D. C.	
	IATA Regulations relating to the carriage of restricted articles by air	International Air Transport Assn., 1060 University St., Montreal 3, Quebec, Canada	
Air Express	Air Express Div. Tariff No. 1, no charge	Tariff Mailing Bureau, Railway Express Agency, 219 East 42 St., New York 17, N. Y.	
Parcel Post and Air Mail	POD Publications 2 and 3 on Packaging and Postage Rates	Local Post Office or Postal Services Div., Post Office Dept., Washington 25, D. C.	Post Office Department

1 Shipments employing two or more methods of transportation, such as truck and air or rail and water, must comply with regulations for each type of shipment; more than one jurisdiction may apply.

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WOODEN CONTAINERS

by T. J. Luddy*

Increasingly, industry is taking a new look at the costs of physical distribution. The entire flow, from incoming raw materials to delivery of the product to the consumer at the end of the line, is being scanned to stop the drain on profits. Coordination of the various elements or functions comprising physical distribution is one of the important steps being taken as a result of this intensive search. Containerization is a clear example of how the packaging, handling and transportation functions can be merged to gain economies all along the line.

Wooden containers figure importantly in containerization. The favorable strength-to-weight ratio of wood and its durability (toughness and resistance to the elements) are being used to good advantage in a wide variety of applications in the handling, shipping and storage of materials and products. Bin boxes, modular panel packaging systems and van boxes are some of the industry developments which have resulted from changes in the role of containers. These, and developments involving the marriage of wood with other packaging and container materials, dominate the efforts of designers and manufacturers of wooden containers.

*Secretary, National Wooden Box Assn., Washington, D. C.

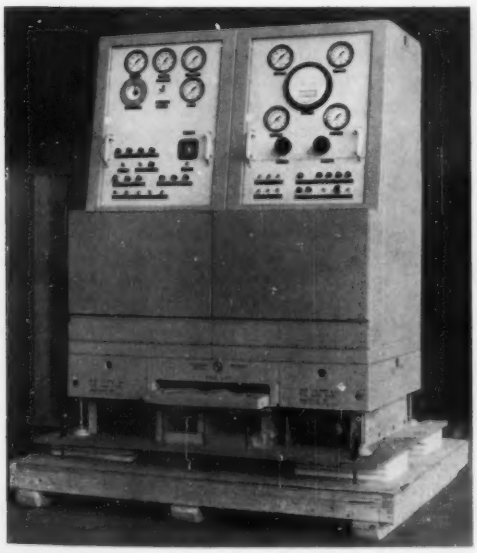
New developments

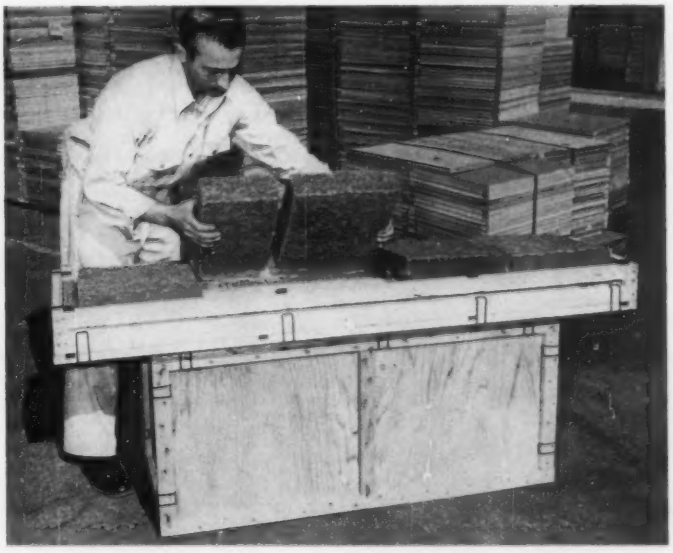
Modular panel container system. Industrial users of shipping containers, particularly the military services and firms producing equipment and supplies for military use, have found the modular cleated panel container system to be an efficient, economical answer to some of their container requirements. The system enables users to stock standard container panels in relatively few sizes. These can be used in various combinations of ends, sides, top and bottom to develop a large number of container sizes. For instance, a supply of panels in a range of 50 sizes presents the user with an inventory of more than 320 container sizes. The panels can be of various construction and are completely interchangeable through control of the cleat dimensions and arrangement. Panels are returned to stock after use and can be re-used in an entirely different container assembly. Fasteners are available for use in this system; they are applied and removed easily without damage to the panels and yet provide the required strength to complete the assembly. Some of the more widely used detachable fasteners are shown in accompanying illustrations. Nailing, strapping or bolting also can be used.

Bin boxes. The coordination of packaging and materials handling has given rise to a type of container designated by the wooden-box industry as a "bin box." Handling advantages are features of this high-capacity container which is being used extensively in industry and agriculture and, more recently, as a consolidation container for finished merchandise in shipments to points for local warehousing and direct sale. The principal advantages of bin boxes are found in reduced handling and packaging because of the larger unit.

Both re-usable and expendable bin boxes are in use. The re-usable types are favored for agricultural applications. Many designs can be completely knocked down or collapsed for space-saving storage or return shipment.

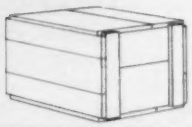
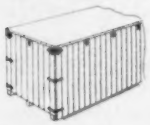
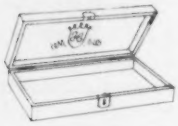
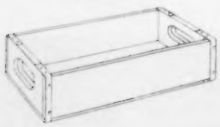
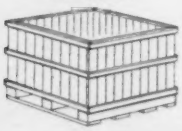
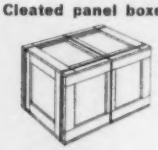
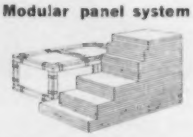
Combination of materials. Packaging designers have turned increasingly



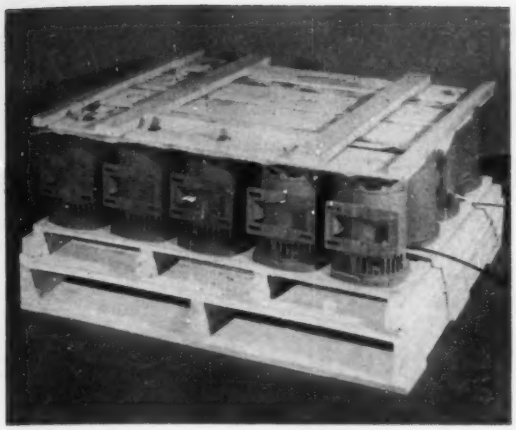


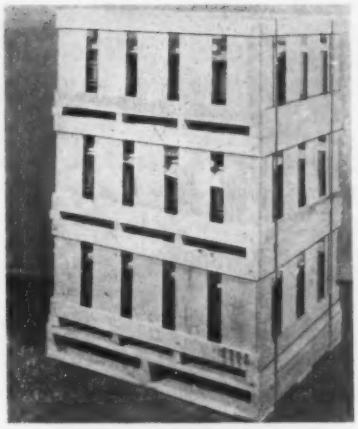
CONSOLE pack (left) wrapped in polyethylene, shipped in open crate has low tare weight, saves materials, labor and transportation costs. Its box-beam base combines rebound springs and polyethylene foam pads as suspension system. Fork-lift entry ports assist tie down. No damage is reported in 50 cross-country shipments. WITH MODULAR panels (right) custom-tailored shippers are assembled from stock sizes with re-usable spring steel fasteners. Box for computer is shown. (*North American Aviation photos*)

Wooden containers at a glance

TYPE	DISTINGUISHING CHARACTERISTICS	CONSTRUCTION AND USE FEATURES	APPLICATIONS	SPECIFICATIONS
Nailed wooden boxes (industrial) 	Stacking strength. Rigidity. Sawn wood construction.	Complete enclosure. Machine or hand, nailed assembly. Eight recognized styles. Capacity to 1,000 lbs.	Equipment, machinery. Moderate- to high-value items. Domestic, export.	PPP-B-621 NWBA I-1B and various carrier regulations.
Nailed wooden boxes (agricultural) 	Sawn wood construction. Ventilation provided.	Palletizes well. Unaffected by high humidity or water exposure. Storage, shipment, display. Nailed assembly.	Wide variety of fresh fruits and vegetables.	Railroad and motor freight container tariffs.
Crates, sheathed 	Sawn wood or wood and plywood construction. Good mechanical handling features.	Fully enclosed, weatherproof. Nailed or bolted assembly.	Equipment requiring weatherproof protection. Domestic and export use. Size range to maximum limit of handling gear.	MIL-C-104. Various commercial specifications.
Crates, open 	Structural sawn lumber framing. Includes mechanical handling features.	Nailed or bolted assembly. Light weight.	Equipment not requiring waterproof protection. Domestic and export. Wide size and capacity range.	MIL-C-132 MIL-C-3774 Commercial specifications.
Finished boxes, cases 	Protection, sales-appeal, functional and secondary-use features. Attractive appearance — quality, value.	Fine wood, plywood, construction. Assembled by nailing, gluing or with screws. Hinged opening or drawers.	Precision instruments, gauges, gifts, silverware, jewelry. Protects and facilitates use.	Individual design.
Tote boxes 	Durability. Incorporates handling features. Sawn wood construction.	Approximate 100-lb. maximum weight capacity. Nailed assembly. Re-use.	In-plant and distribution handling (beverage cases, milk crates). Fruit, vegetable harvesting and storage.	Industry type or individual designs.
Bin boxes 	Relatively high capacity. Mechanical handling features.	Sawn wood or plywood. Re-usable and expendable types. Also collapsible and non-collapsible designs.	Wide range of industrial, agricultural handling and shipping applications.	Individual, engineered-to-use designs.
Cleated panel boxes 	Stacking strength. Rigidity. Complete enclosure. Relatively watertight. Lightweight. Product identity and advertising.	Plywood, paper-overlaid veneer, solid and corrugated fibreboard. Nailed assembly. Maximum capacity approximately 400 lbs.	Appliances, machinery and equipment. Export and domestic shipment.	PPP-B-591 PPP-B-601 MIL-B-10377 MIL-B-21825
Modular panel system 	Standard interchangeable panels. Variety of closure methods.	Fast opening and closing. Reduced inventory. Re-use.	Shipment of a wide variety of single and multiple items. Domestic and export.	MIL-B-26241 MIL-P-9902

*Source: National Wooden Box Assn.





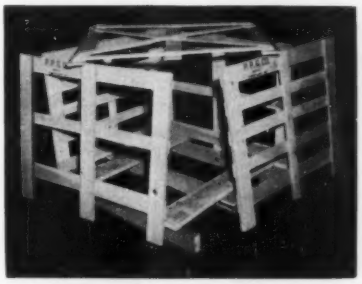
KNOCKED-DOWN for economical return, the components of this multiple-unit motor pack are re-usable. It allows efficient handling in easily-inventoried multiples for both manufacturer and purchaser. Loads imposed by high stacking are supported entirely by the container, providing economy in storage. This unique design permits shipments of 20, 40 or 60 motors in a completed pack and will accommodate five different motor heights. Slightly modified, it can be used for various shaft lengths. *(Bigelow Garvey Lumber Co. photos)*

toward combining materials to develop the degree of protection required to provide safe handling and shipment of materials and equipment. In many instances wood and wooden containers have been selected to provide the functions which they do best —of containment, means of handling, stacking and protection from outside forces in conjunction with materials that will exclude damaging humidities and cushion and isolate the contents from destructive shock and vibration.

Cleated panel boxes consisting of sawn wood cleats and framing-panel material such as plywood, paper-overlaid veneer and solid or corrugated fibreboard have the advantage of the wood for stacking strength and the additional advantages of the panel material, such as reduced weight and improved printing surface available for product advertising. Plastic films are combined with wood packaging for product protection ranging from exclusion of dust and grime to maintenance of a low-humidity atmosphere. Suspension systems in wooden containers, consisting of mechanical mounts and cushioning pads, eliminate or minimize the effect of damaging shock and vibration.

Other developments. Efforts to reduce the over-all cost of packaging are reflected in the steps taken by the box industry to mechanize the assembly and use of wooden containers at the user's facilities. Western wooden box manufacturers have under development a machine to pack cantaloupes automatically in nailed wooden crates, assuring the growers and packers a continuation of their present method of handling and cooling while reducing over-all costs. These same manufacturers are working with Western growers in adapting existing container designs, developing improved packing and loading methods and promoting advances in handling aimed at improving the delivered quality of fruits and vegetables.

Portable driving tools of proven merit for both nails and staples are available, eliminating the need for hand nailing at the user's facilities. These lightweight tools can be used for assembling the boxes; also for fastening the blocking, bracing or the container closure. Being portable, the packing operation can be decentralized and accomplished at the work stations throughout the plant.

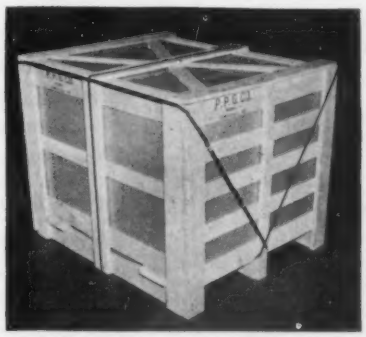


EASILY assembled, this specially designed bin box for high-grade mirror glass cuts material, labor and freight costs of storing and shipping (see below).

Major areas of use

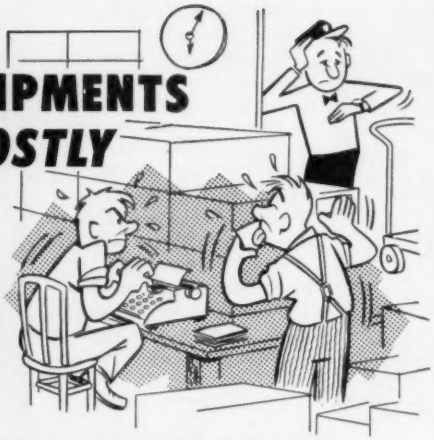
Lumber for wooden boxes and crates consumes about 10% of the lumber used for all purposes in the United States or approximately 3.6 to 3.8 billion board feet per year. The importance of this outlet to the lumber industry exceeds that which its percentage of the total would indicate, because of the opportunity it presents to utilize grades, species and sizes which could not otherwise find such high use in other applications. The value of wooden boxes and crates as compiled by the Census Bureau, Department of Commerce, in their 1958 Census of Manufactures is $236 million. This covers only products manufactured for sale and does not take into account the volume produced by container users for their own opera-





ADAPTED for use with corrugated pads, standard wood fillers, design reduces number of container sizes needed. Customer handling is improved and high stacking increases warehouse capacity. *(Cumberland Box Co. bin, Pittsburgh Plate Glass Co. photos)*

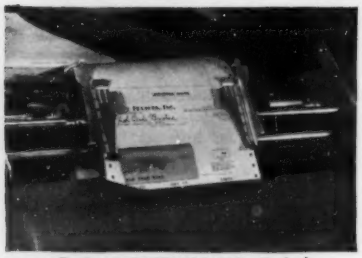
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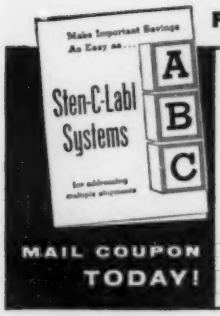
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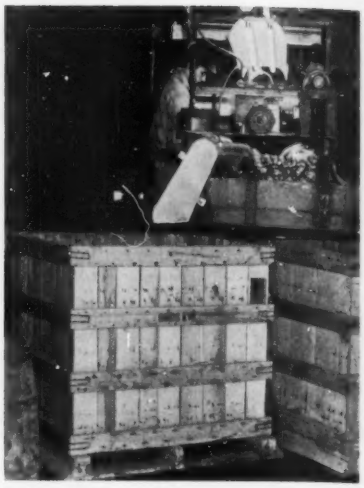
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BIN BOXES aid frozen-food processing. After washing, grading, potatoes are dumped into bins, weighed, stored—until needed for processing. (*J. H. Dunning Corp. photo*)

tions, which may be as high as $150 million annually.

Industrial containers. The industrial application of wooden containers includes both shipping uses and materials handling of materials and processed goods. Sawn-wood shipping containers are used extensively for the shipment of heavy, fragile products and equipment, being particularly well adapted to loads classified as Type 2, partially receiving support from the contents, and Type 3, where the container cannot rely on support from the contents. A wide variety of styles and designs of wooden boxes is used, but generally they fall into the categories illustrated on page 704.

Containers that feature a combination of wood with other container materials such as plywood, paper-overlaid veneer and solid fibre are in wide usage for the shipment of industrial products. The sawn wood generally serves as the cleats and load-bearing members and the associated container material is used to complete the enclosure. Sawn lumber provides the required compressive strength, the rigidity and the means of assembly.

Industrial tote boxes of sawn wood and plywood construction are an essential part of the materials-handling systems employed by most industries. They are available in many sizes, designs and features, many developed for the specific application. The ease of fabrication and the relatively low cost as a re-usable container, coupled with the high degree of protection af-

forded, makes them a popular choice among materials-handling and industrial engineers.

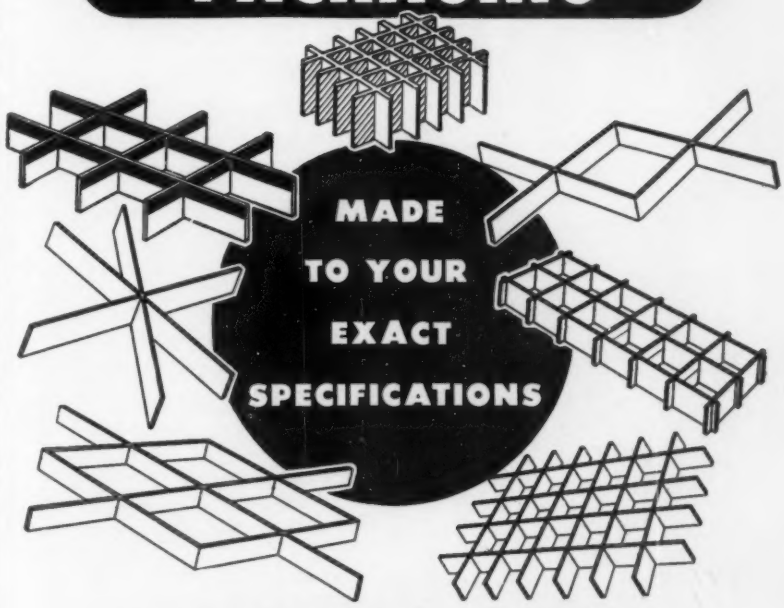
Finished boxes. The warmth and appeal of wood and the image of quality which fine finished woods instantly arouse have continued and have increased the demand for fancy wooden boxes for display and consumer packaging. Closely associated with this appeal to the aesthetic sense is the very practical function of the substantial container in protecting the valued article through its long years of use. Silver chests and jewelry boxes attest to the continuing service of the containers which initially served to create a buying demand. Individual wooden boxes for precision instruments such as gauges, microscopes and measuring devices assist in maintaining the accuracy and reliability of the devices and prevent damage while in storage or transit.

Agricultural containers. Wooden containers are used for the harvesting of the fruit and vegetable crop and for the shipment of produce to market. The harvest containers generally are re-usable and are carried over from season to season. Within comparatively recent years, the bin box or pallet container has found wide usage for certain crops.

Sawn-wood fruit and vegetable containers have been found to be particularly adaptable to the newer developments in the shipment of produce to distant markets. Such innovations as hydrocooling of the packed produce and maximum loading of the carrier vehicles (for a preferred rate) require containers which are unaffected by moisture and have high compressive strength to withstand the superimposed weight.

Re-usable wooden containers are used extensively to carry products from manufacturers and wholesalers to retail outlets and to the consumer. The best examples of this would be the familiar beverage case and milk crate. Similar systems employing standard re-usable containers are used by wholesale drug firms and by the grocery chains in servicing the retail outlets from the warehouse. The durability of wooden containers, their ability to fit into handling systems and to be used efficiently with materials-handling equipment are the chief reasons wooden containers qualify for these applications. Of no small consequence is the fact that the container cost per trip for many of these applications is

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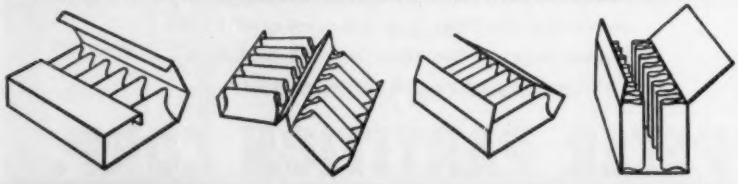
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Export. Wooden boxes and crates stand in the fore among container types used for export packing. The combination of hazards peculiar to export are such that the superior protection of wooden containers is in demand. Export containers must be sufficiently strong to withstand the additional manhandling in the on-and-off loading of the ship and to resist the high compressive forces encountered in hold-stowage. Wooden containers score well on these counts and also in their capacity to stand up to the high humidities or occasional exposure to the elements which are a routine hazard in ocean commerce.

The flexibility in the design and production of wooden containers makes it possible to tailor to the exact needs of the item, whether the need be for few containers or many.

Military. Use of wooden boxes and crates by the military services continues at a high level. The range of items of supply and equipment carried in wooden containers is practically as wide as the variety of items which the military utilizes. Standard styles and types of wooden boxes, particularly Styles 2 and 4, are used for conventional items of supply, particularly for overseas shipment and long-term storage. Both open and sheathed crates are used for the larger and heavier equipment and major components, and also for unitizing to facilitate handling and give added protection for quantities of packaged items.

With increased reliance placed on supply and support by air, wooden containers have been redesigned to reduce to a minimum the tare weight and cubic displacement. This trend has led, also, to an increased use of cleated panel boxes and plywood-sheathed crates. The success of this program in attaining savings in weight and cube while maintaining product protection is a tribute to Government packaging engineers and logistic planners as well as to the wooden-container manufacturers and designers.

Some of the newer developments in the packaging and handling of military supplies and equipment include demountable plywood household-goods crates, modular panel packaging systems for interbase shipments and shipments from suppliers to the military, and box pallets for efficient long-term depot storage.

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Effective use of wirebounds

Protection of its contents against the hazards of ordinary handling and shipping is the foremost function of a shipping container. And it should be accomplished as economically as possible without sacrificing safety.

In addition to protection, usually there are other requirements to be satisfied. Sometimes packages of even cumbersome size or great weight, or both, must be high-stacked for long periods of time in warehouses. Containers sometimes must be opened and reclosed between shipping point and ultimate destination to permit inspection of the contents or the installation or removal of parts. Open-sided crates often are demanded to permit constant inspection of the contents and prevent the delivery of merchandise with "hidden damage." Additional protection against moisture often is needed, particularly in export shipments or when goods are stored in humid climates. It is particularly important in export shipment that pilferage be quickly discovered.

Thus, there really can be no "standard" shipping container, no container engineering formula or technique that can serve all products or all industries.

The industrial shipping container, therefore, is a truly engineered container designed and built specifically for its own purpose.

The wirebound container is engineered on the scientific principle that relatively light wood reinforced with steel wires is as strong as or stronger than heavier wood not so reinforced.

The combination of wood and wire permits engineering versatility to meet practically any packing, shipping, handling or warehousing requirement so that now wirebound containers range in size from inches to many feet and in contents from delicate electronic and precision instruments to metallurgical ores and ingots.

By varying the types of wood used, the dimensions and thicknesses of slats, faceboards and cleats, the placing of cleats, the gauge, number and placing of binding wires, the type and construction of container ends and the types of closures, the wirebound shipping container engineer is able to design highly effective and economical protective shipping containers for almost any purpose.

By precise engineering design and construction, the exact amount of built-in rigidity, resilience, shock absorbence, etc., can be controlled.

Although the usual wirebound container consists of a one-piece, four-section wirebound blank that is folded to form the four sides, plus the ends or the top and base, wide variations in shape are possible.

Even in ends, or tops and bases, versatility of design is the rule. They can be nailed in place or held in place by proper arrangement of end cleats of the blank without nailing. In the "all-bound" type container, the ends are attached with wire-loop fasteners to provide a high degree of resilience and shock absorbence.

No matter what the design of the wirebound container, an important benefit to shippers is that the containers are wholly prefabricated and are shipped flattened and bundled.

The methods of packing wirebound containers for shipment vary almost as much as do types of wirebound boxes and crates. Many articles, particularly major household appliances, are literally assembled upon the bases of their shipping containers so that, at the end of the assembly line, the product is "wrapped up" in a wirebound blank, or covered with a hood pre-formed by joining the blank and the top. Jumble-packed products often pour from conveyors into wirebound boxes direct from the final manufacturing operation. Some products, particularly those of delicate or fragile nature, require specially engineered and constructed interior packing and bracing. Plastic or paper bags are often used to protect the contents against dust and moisture when an open wirebound is used.

A fairly new type of wirebound container that is fast gaining favor is the pallet bin for intraplant materials handling or bulk shipment of jumble- or place-packed products.

Such containers have drastically cut labor costs in the canning and other industries by eliminating repeated handlings. They reduce warehouse space requirements by permitting heavily loaded bins to be high-stacked in minimum area, prevent waste and spoilage by permitting strict segregation of different types of raw materials during storage and shipment, simplify movement of partly finished goods between production stations, and speed loading and unloading.

Some wirebound pallet bins are engineered so that each side, the base and the top are individual sections, the sides joined together with special wire-loop fasteners. These bins can be dismantled quickly and returned to the place of shipment to be re-assembled and re-used. Other bins are designed so that, when empty, they can be nested together.



EFFICIENCY. Two hexagonal ends and a six-section, one-piece wraparound blank comprise wirebound crate for packing crankcase assembly. Form-fitting container permits handling four units on pallet. Thus capacity was doubled for handling equipment and warehousing. (*Wirebound Box Mfrs. Assn. photo*)



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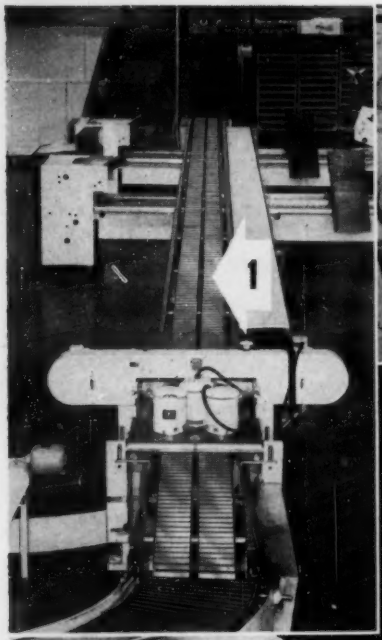
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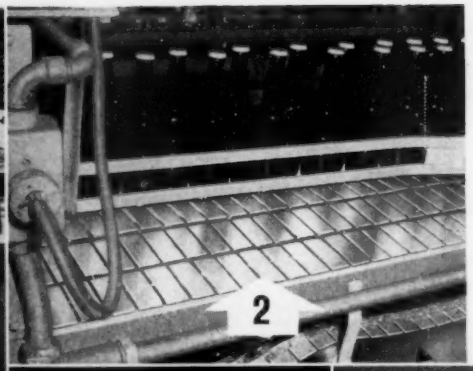
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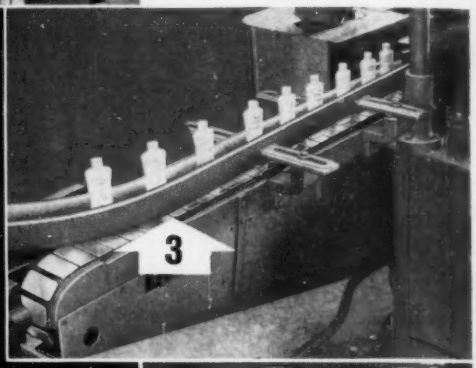
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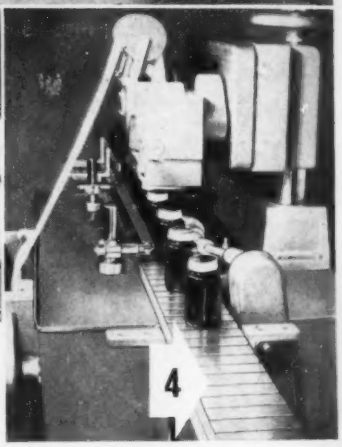
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FREE PRODUCT LITERATURE

This section is a review of free literature made available by the companies who supply basic packaging materials, containers, machinery, equipment and services for producers of packaged products. Some of these items have been listed in the Manufacturers' Literature pages of MODERN PACKAGING during 1961, but many listings are new.

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Packaging Line, Package-making and Specialty Equipment 720

Package Design and Planning, Testing Equipment and Custom Services

CUSTOM PACKAGING. 8-page brochure that covers Wilco's non-food packaging plan. Outlines their services from analyzing your product to manufacturing, packaging and delivering within the Western market. Wilco Co. **(R-1)**

IMPACT-ACCELERATION MEASURING EQUIPMENT. 4-page illustrated catalog folder describes equipment designed for use in measuring impact and acceleration rate in product shipment or transport of people. Impact-O-Graph Corp. **(R-2)**

COMPRESSION TESTER. Data sheet describes a new type recording package-compression tester. Tester is specifically for shipping containers, packages and packaging materials. Includes specifications and diagrams. L. A. B. Corp. **(R-3)**

TRANSPORTATION SIMULATORS. 6-page catalog illustrates and describes a full line of transportation simulators, including vibration testers of 100 to 10,000 pound capacities. Gives specifications and dimensions. L. A. B. Corp. **(R-4)**

PAPERBOARD TESTING. Illustrated 8-page booklet describes testing facilities and methods for paperboard and paperboard containers subjected to conditions showing true characteristics under certain conditions. Crown Zellerbach Corp., Gaylord Container Div. **(R-5)**

CONTAINER DESIGN. 12-page illustrated guide to container design from graphic impact, merchandising requirements and opportunities to use of color as a psychological tool. Container evaluation chart included. J. L. Clark Mfg. Co. **(R-6)**

CUSTOM PACKAGING. 12-page illustrated booklet describes a single source for integrated plastic and paper packaging requirements, from creative design through production, offering a wide choice of packaging processes and materials. Creative Packaging, Inc. **(R-7)**

TESTING INSTRUMENTS. Illustrated 6-page brochure gives specifications on micrometers for exact calipering, including portable micrometer for accurate thickness calipering. Also, electric motor-driven bursting strength tester. E. J. Cady & Co. **(R-8)**

CANNED CARBONATED BEVERAGES. 40-page survey report on consumer attitudes toward canned carbonated beverages. Continental Can Co. Metal Div. **(R-9)**

PRODUCT MANUFACTURING & PACKAGING. Descriptive 8-page brochure illustrates and outlines contract manufacturing, packaging, warehousing and distribution facilities designed for manufacturers in the food, drug, pharmaceutical and cosmetic industries. Packaging Corp. of America. **(R-10)**

PAPER & PAPER PRODUCTS. Illustrated 4-page folder lists this independent laboratory's testing facilities, typical paper products and properties tested; and services of package testing laboratory. United States Testing Co., Inc. **(R-11)**

BALL REBOUND TESTER & GAS TRANSMISSION CELL. Two data sheets illustrate and fully describe (1) ball rebound tester consisting of a 1.5 inch inside diameter vertical clear plastic tube into which a ⅝ inch diameter steel ball is released by a magnet, and (2) Dow gas transmission cell designed for use in determining the gas transmission rates of plastic sheeting and plastic coated papers. Custom Scientific Instruments, Inc. **(R-12)**

COMPRESSION TESTING MACHINES. Two illustrated brochures describe compression testers, include information on TMI Universal Testers, the

Hinde & Dauch Crush and accessories available for making over 15 different tests. Illustrations of squeeze, squash, bend, yank and jab applications are included. Testing Machines, Inc. **(R-13)**

SLIP AND FRICTION TESTER. 2-page data sheet describes construction and features of a slip and friction testing unit. Testing Machines, Inc. **(R-14)**

PACKAGING. Illustrated folder describes services of company that offers complete packaging services. Includes discussion of Christmas overwraps, and laminating. Kehr Products Co. **(R-15)**

CONTRACT PACKAGING. Illustrated 4-page brochure describes the facilities and services of a contract packager. Services include product development, compounding, warehousing and drop-shipping. Acepak, Inc. **(R-16)**

TEST ABRASER. 12-page illustrated booklet describes precision built test instrument designed to evaluate the resistance of surfaces to rubbing abrasion. Applications include tests of painted, lacquered, electroplated surfaces and plastic coated materials, etc. Complete description, specifications, price list, other data. Taber Instrument Corp. **(R-17)**

SHEAR/SCRATCH TESTER. 4-page illustrated bulletin gives operating instructions for testing the surface quality of organic rigid sheet materials and coated surfaces to resist digs, scratches, scrapes and similar damage not classed as normal wear. Taber Instrument Corp. **(R-18)**

ADVERTISING SPECIALTIES. Colorful 40-page catalog presents advertising specialty items with full data and prices. Catalog includes order form and samples of promotion material. American Advertising Specialties Co. **(R-19)**

CONTRACT PACKAGERS. 6-page brochure describes and illustrates facilities for packaging, marketing and production of aerosol and liquid products. Fluid Chemical Co., Inc. **(R-20)**

UNIT PACKAGING. 10-page brochure illustrates and describes in detail unit packaging service which includes warehousing of products in bulk and unit packaging products in endless variations, on advanced machinery. Ivers-Lee Co. **(R-21)**

DISPLAY PACKAGING. 4-page folder gives important information about an exclusive display-packaging service. Services include design, print, die cut, and film applications. The packaging machine used is described and is available for in-plant use. The Nevins Co. **(R-22)**

SHIPPING. 16-page illustrated catalog describes complete line of shipping container mounting systems that offer engineered protection against shipping damage. Lord Mfg. Co. **(R-23)**

Materials Selection (Films, Foils, Paper, Plastics, Metals, etc.)

PLASTICS IN PACKAGING. 12-page booklet reviews the use of plastics in packaging. Discusses physical shapes, surface printing and choice of materials, among other packaging considerations. Contains case histories on how new packages are adopted. Monsanto Chemical Co. **(R-33)**

PACKAGING PAPER. 16-page full-color booklet describes and illustrates paper-mill facilities and processes in the manufacture of packaging and packaging materials. Continental Can Co. Paperboard Div. **(R-34)**

PRE-COATED ALUMINUM FOIL. Data file describes and gives samples of pre-coated aluminum-foil stock, custom produced for lithography. The product, Analith, gives protection and outstanding visibility. Anaconda Aluminum Co. **(R-35)**

RUST PROTECTION. Booklet describes a line of packaging papers and barriers coated with an organic chemical compound that vaporizes very slowly, protecting metal packages and parts against rust. Ludlow Papers, Inc. **(R-36)**

HEAT SEAL PAPERS. Extensive data file gives important information on types of heat-seal coatings available for use by hand or automatic machine devices. Includes a specific purpose and application chart. The Brown-Bridge Mills Inc. **(R-37)**

POLY-VINYL DISPERSION. 14-page booklet illustrates and discusses Chem-O-Sol, a new coating and molding material with a specially formulated high molecular weight, poly-vinyl dispersion. The booklet describes the properties and some of the applications of Chem-O-Sol, points out new uses. Chemical Products Corp. Sub. of Goodrich-Gulf Chemical. **(R-38)**

PACKAGING FILM. A 16-page illustrated booklet describes various types and uses of polyethylene film. Includes a listing and description of the types of film for particular purposes. Visking Co. Div. of Union Carbide. **(R-39)**

LAMINATES. Brochure describes a wide variety of laminates in high-yield rolls in combinations of plastic, fabrics, and other materials. Includes samples and list of advantages. Lamart Corp. **(R-40)**

POLYPROPYLENE FOR PACKAGING. Technical data folder describes the properties of polypropylene film for packaging. A sample application and other data are included. Enjay Chemical Co., Div. of Humble Oil and Refining Co. **(R-41)**

PACKAGING MATERIALS. Folder and sample sheets describes line of plastic-coated and laminated packaging materials. Samples include pouch paper, blotter paper, gold metallic—all coated with polyethylene. Typical applications include packaging for foods, tobacco, soft goods, hardware, etc. The Marvellum Co. **(R-42)**

CORRUGATED BOARD. Handy 6-page selector guide describes line of corrugated board with characteristics and applications of each size. Also includes Rule 41 Classification Data. Owens-Illinois Paper Products Div. **(R-43)**

COVER PAPER. Sample sheets: 16 stock colors, three stock embossings, two stock weights. Special colors and duplex combinations. For sales manuals, catalogs, proposal covers, legal covers, school supplies, etc. Wyomissing Paper Prods., Div. of Narrow Fabric Co. **(R-44)**

PLIOFILM. Illustrated 18-page booklet discusses this homogeneous, rubber chloride, plastic film as a packaging material and describes a variety of applications in detail. End-use chart for all types and gauges included. Packaging Films Dept., Goodyear Tire & Rubber Co. **(R-45)**

KRAFT PAPER. Sample book features extensible kraft paper with two-way stretch that defies shock, reduces breakage, prints sharp. Scott Paper Co., Hollingsworth & Whitney Div. **(R-46)**

GUMMED PAPERS. Folder gives a selection of gummed paper samples, in color, together with unique features and data. The Brown-Bridge Mills, Inc. **(R-47)**

ALUMINUM FOIL DESIGN. 16-page booklet describes aluminum foil as a display medium—for packaging, labels, signs, advertisements, promotional materials, brochure covers, etc. Booklet has lithographed foil covers and pages. Anaconda Aluminum Co. **(R-48)**

GLASSINE & GREASEPROOF PAPER. Small sample book of glassine and greaseproof papers and general information on the papers. Glassine & Greaseproof Manufacturers Assoc. **(R-49)**

NYLON FILM. Three data sheets and 8½ x 11" printed sample fully describe mechanical strength properties and chemical resistance of Fosta nylon film. Applications and complete specifications included. Foster Grant Co., Inc. **(R-50)**

PLASTIC MATERIALS. 4-page folder lists services and complete line of this manufacturer's products—cellulose acetate molding compounds, polystyrene molding compounds, etc. Complete details available for specific requirements of plastic-material users. Plastic Materials & Polymers, Inc. **(R-51)**

EXTRUSION LAMINATIONS. 6-page folder describes advantages of laminations with extruded polyethylene to meet every flexible packaging need in pouches, bags, sheets, or rolls. Includes complete facilities available. Flexible Packaging Div. Continental Can Co. **(R-52)**

SPECIALTY PAPERS. 12-page booklet outlines research, manufacturing, and quality-control facilities utilized in developing specialty papers to shield, insulate, cushion, laminate, etc. Knowlton Brothers. **(R-53)**

PACKAGING FILMS. Extensive data file gives technical information and description of two packaging films: Fluorohalocarbon film and Polyamide film. Allied Chemical Corp. General Chemical Div. **(R-54)**

NEW SOLID PAPERBOARD. 4-page brochure illustrates and describes a new solid paperboard produced entirely from virgin pulpwoods. "North-Brite Blended" (paperboard) has the ability to accept all conventional coatings. Brochure also outlines completely integrated facilities of producer. Packaging Corp. of America. **(R-55)**

PLASTIC FILMS AND SHEETS. 10-page booklet describes thermoplastic films and sheets and their wide application in packaging. Includes technical data and table of properties. Joseph Davis Plastics Co. **(R-56)**

SPECIALTY PAPERS. 12-page brochure describes a versatile, economical paper material with many unusual technical and industrial uses. Discusses research and process in papermaking. Knowlton Brothers. **(R-57)**

GREASEPROOF PAPERS. Booklet gives samples of 17 glassine and greaseproof papers, in color, suitable for a wide variety of packaging. Sizes and specifications included. The Hamersley Mfg. Co. **(R-58)**

INDUSTRIAL PACKAGING & SHIPPING. 4-page brochure describes a highly durable and grease-resistant industrial paper with many packaging uses. Photos show its use as backing sheets for pressure-sensitive decorating materials. KVP Sutherland Paper Co. **(R-59)**

NYLON FILM. A reference file lists and gives the properties of nylon film versus other materials. Data and specifications included. M & Q Plastics Products. **(R-60)**

WATER SOLUBLE FILM. 7 data sheets give complete information about cold water soluble film fabricated from polyvinyl alcohol. Includes price schedule and specifications. Mono-Sol Corp. **(R-61)**

RELEAFING PARCHMENTS. Extensive data file describes and illustrates applications of a variety of releafing parchments. Samples for a variety of products, including foods and candy, are included. Paterson Parchment Paper Co. **(R-62)**

HIGH-STYLE PARCHMENT. Sample file contains a wide variety of types of parchment created to glamorize such products as wrappers and liners, or as distinctive stationery items. Paterson Parchment Paper Co. **(R-63)**

GLAZED PAPERS. Brochure gives a dozen samples of glazed paper in a variety of 70 colors. Features long shelf life, excellent scuff and soil resistance. Wyomissing Paper Products. **(R-64)**

GUMMED PAPERS. Sample book shows line of gummed papers, including booklet on selection of gummed papers and printing on them. Ludlow Papers, Inc. **(R-65)**

C-B BONDED WADDING. Illustrated swatch brochure explains advantages of Cel-Fibe, C-B bonded wadding especially in protective packaging. Photos illustrate such typical applications as wrapping furniture, cushioning glassware, buffering bottled liquids and other fragile items in multiple packs. Cel-Fibe Div. of Personal Products Corp. **(R-66)**

BLOW-MOLDING FORTIFLEX. 18-page bulletin gives detailed data on two rigid high-density olefin polymers used in blow-molding industrial and consumer products. Includes injection and extrusion blow-molding data, charts, mold and product design considerations. Celanese Polymer Co. **(R-67)**

VINYL RESIN SHEETING. 12-page booklet describes and illustrates vinyl resin sheeting and its wide application for packaging. Gives specifications and plant service data. Diamond Alkali Co., Plastics Div. **(R-68)**

RUST INHIBITOR. Illustrated sheet describes and supplies samples of discs containing a chemical rust inhibitor that makes unnecessary the wrapping of small parts to prevent corrosion. Chippewa Paper Products Co., Inc. **(R-69)**

PACKAGING PLASTICS. 18-page book discusses a full line of plastics for use in packaging a wide range of products. Describes and gives applications of flexible film, coatings and laminations, bubble and blister packaging, among others Eastman Chemical Products, Inc. **(R-70)**

CELLULOSIC PLASTICS. 8-page brochure describes and illustrates application of Tenite cellulosic plastics for packaging. Includes a detailed table of properties. Eastman Chemical Products, Inc. **(R-71)**

SILICONES. 8-page illustrated catalog describes a complete line of silicones and their application to packaging. Includes important technical data. Silicone Products Dept., General Electric. **(R-72)**

POLYETHYLENE RESINS. Data folder lists commonly used Petrothene polyethylene resins, with their main characteristics and applications. U. S. Industrial Chemicals Co., Div. of National Distillers and Chemical Corp. **(R-73)**

RIGID FOAM. 4-page folder describes Vultafoam, a pour-in-place polyurethane rigid foam. Includes suggested applications and special characteristics. General Latex and Chemical Corp. **(R-74)**

POLYSTYRENE IMPACT SELECTOR. Bulletin gives important data about polystyrene, graft copolymers; dial device allows selection from a wide range of impact-strength specifications. Rexall Chemical Co. **(R-75)**

INDUSTRIAL PLASTICS. 8-page booklet describes and details characteristics of a variety of plastics and resins. Included are polypropylene, polystyrene, polyethylene, and Epon resins. Shell Chemical Co. **(R-76)**

Adhesives, Coatings and Tapes

PACKAGING PLASTICS. A 42-page spiral-bound technical data book describes "half second Butyrate" and its application in cloth and paper coatings, heat-sealing adhesives, and specialty coatings. Eastman Chemical Products, Inc. **(R-87)**

PRESSURE-SENSITIVE TAPES. 30-page data file describes a full list of pressure-sensitive tapes, including general-purpose tape, masking tape, and strapping tape. Behr-Manning Co. **(R-88)**

VACUUM COATINGS. 4-page folder describes in detail functional and decorative vacuum coatings. Enables plastic or wood models to look like metal, among other advantages. Poly-Kote, Inc. **(R-89)**

BAG & CARTON ADHESIVES. Technical bulletins on a wide variety of pastes and dextrines for paper and cellophane bags. Union Paste Co. **(R-90)**

ADHESIVES. 16-page illustrated booklet describes packaging and paper converting adhesives for carton and case sealing, folding cartons, window boxes, tube winding, kraft bags, etc. General descriptions, features, physical and chemical properties. Armour Alliance Industries, Industrial Adhesives Div. **(R-91)**

REINFORCED SEALING TAPE. 4-page folder gives comparison of use of sealing tape, staples, glue, paper tape and reinforced tape. Ludlow Papers, Inc. **(R-92)**

PAPER CONTAINER ADHESIVES. 28-page catalog lists adhesives for folding cartons, glued-lap containers, set-up boxes, fibre cans, tubes and drums. H. B. Fuller Co. **(R-93)**

COATING FOR FIBREBOARD. A 4-page folder describes and illustrates applications of a new coating for corrugated fibreboard. Coating prevents product damage due to abrasion without leaving unsightly deposits on the product. Inland Container Corp. **(R-94)**

ALL-PURPOSE COATING. 9-page data file describes Ball AP, a new all-purpose coating for glass containers which gives abrasion protection plus many other advantages. File includes laboratory test reports and specifications. Ball Bros. Co. **(R-95)**

BOX TAPES. 6-page fold-out brochure describes and gives samples of "Safetex" Box Tapes in three different varieties. Weights and applications are included. Central Paper Co. **(R-96)**

PRESSURE-SENSITIVE TAPE. 52-page illustrated booklet describes a variety of pressure-sensitive tapes and their applications for the metal-working industry. Includes tape data and index table. Minnesota Mining and Manufacturing Co. **(R-97)**

CARTON COATINGS. 8-page brochure describes a number of extremely high gloss polyester coatings to enhance eye appeal and give added protection to packages. Equipment and methods for application are also discussed. Interchemical Corp., Finishes Div. **(R-98)**

ADHESIVES. Folder describes new adhesives for a variety of products, including vinyl plastic, fiberglass, metal, glass and nylon. Rubba, Inc. **(R-99)**

LABEL PASTES. 4-page service bulletin describes Casco Ice Proof Label Pastes. Discusses label pastes generally and gives specifications and advantages of ice-proof label pastes. The Borden Chemical Co., Div. Borden Co. **(R-100)**

STRAPPING TAPES. Folder describes a variety of strapping tapes of high tensile strength and flexibility. Gives application examples and technical data. Permacel Tape Corp. **(R-101)**

TEFLON COATINGS. 4-page folder contains applications for Teflon coatings and includes chart listing its typical properties. Reviews advantages—prevents sticking, has good heat and chemical resistance and low coefficient of friction. General Plastics Corp. **(R-102)**

ADHESIVES. 10-page booklet offers twenty-three basic steps to be used as a guide in choosing adhesive for a specific purpose. Includes applications for packaging, labelling, and shipping together with other uses for particular adhesives. Arabol Mfg. Co. **(R-103)**

BONDING. 16-page brochure describes adhesives that are dry, solid, and thermoplastic. Supplied in continuous cord-like form, adhesive is fed into an applicator that melts, feeds, and applies it. United Shoe Machinery Corp. **(R-104)**

ADHESIVES. 4-page bulletin describes in detail importance of choosing the right adhesives for specific purposes. Discusses variety of problems and their solution, packaging and shipping. Arabol Manufacturing Co. **(R-105)**

Bags, Pouches, Wraps

INDUSTRIAL PACKAGING TIPS. 16-page illustrated brochure describes rugged laminated textile shipping sack particularly adaptable when products are alkaline, acidic, abrasive or contain grease or oil. Shows 22 specific types of "job-engineered" laminated textile shipping sacks. Chase Bag Co. **(R-116)**

DRI-PAK BAG. Illustrated 4-page bulletin describes bag of bleached kraft paper laminated to foil with polyethylene coating over the foil. Efficient and suitable package for any hygroscopic item. Crown Zellerbach Corp. **(R-117)**

MULTI-WALL BAGS. Brochure describes and gives samples of material used in a new master shipping container for units not requiring crush protection. West Virginia Pulp and Paper Co. **(R-118)**

MULTI-WALL BAGS. Folder illustrates and describes a new gusseted valve bag for use in the carbon black industry. Describes how box shape and pasted top and bottom provide sift-proofness and easier handling. The Bancroft Bag Factory, Inc. **(R-119)**

WATER-REPELLENT SACKS. Data file describes and gives samples of water-repellent Kraft paper sack material. Light in weight but gives heavy-duty all-purpose performance. Olin Packaging Division. **(R-120)**

PADDED BAGS. Accordion-pleated folder that illustrates the wide variety of products packaged in padded shipping bags. Standard sizes, extra features, etc. Jiffy Mfg. Co. **(R-121)**

SHRINK FILM PACKAGING. Data sheet illustrates and describes a folding and wrapping system for packaging with flat web shrink film. Reduces labor and material costs in wrapping a variety of products. Quick-Pak Machinery Corp. **(R-122)**

PACKAGING FILM. 8-page illustrated book describes multi-purpose packaging film designed for automatic packaging, in-store packaging, overwrapping by hand or machine, window packages. Descriptions, advantages, other data. The Goodyear Tire & Rubber Co. **(R-123)**

ENVELOPES. Brochure describes and gives sizes of 70 envelope styles for a variety of applications in mailing and packaging. Includes chart, easy selection of style and size. United States Envelope Co. **(R-124)**

PLASTIC ZIP BAG. 16-page brochure, packaged in a "zip-lip" bag, describes a full line of paper and plastic packaging products and materials, including the plastic film "zip-lip" bag. Kennedy Car Liner and Bag Co., Inc. **(R-125)**

Rigid and Semirigid Containers (Bottles, Boxes, Cans, Tubes, etc.)

DISPLAY PACKAGING. 8-page illustrated booklet and data sheets describe line of custom-designed or standard packages and promotional specialties—plain, embossed, or printed. Covers contoured dome packaging, custom-contoured and standard slide cover boxes and many others. Plastic Artisans, Inc. **(R-136)**

PACKAGING CANS. 12-page booklet illustrates and describes a complete line of fibreboard containers with a variety of closures and linings. Discusses the importance of design in product adaptation. R. C. Can Co. **(R-137)**

SCEPTERENE CONTAINER. Illustrated bulletin shows container of new material compound designed to carry gasoline, naphtha, varsol, kerosene, solvents, etc., which is non-corrosive, crush-proof, unbreakable, lightweight. Dillon-Beck Mfg. Co. **(R-138)**

CORRUGATED CONTAINERS. 24-page booklet describes process of manufacturing and testing of a complete line of stock and custom corrugated containers. Hoerner Boxes, Inc. **(R-139)**

FABRICATED ACETATE CONTAINERS. Illustrated 4-page catalog showing shapes, sizes, multiple end uses for semi-rigid transparent packaging from nation's largest designer-producer. J. E. Plastics Mfg. Co. **(R-140)**

EXPANDABLE POLYSTYRENE. 6-page brochure gives detailed information about molded expandable polystyrene, and its growing use in product manufacture and packaging. Offers complete services in design and making finished articles. Weber Plastics Inc. **(R-141)**

COSMETIC CONTAINERS. Folder describes and illustrates plastic containers designed especially for the cosmetic industry. Discusses design, control dispensing and inner linings, and lists number of products using these plastic containers. Plax Corp. **(R-142)**

AEROSOL CONTAINERS. 46-page booklet describes in detail a wide variety of aerosol containers called Freon Safe Propellants. Includes illustrations, charts, table of properties and applications for various products. E. I. du Pont de Nemours & Co., Inc., Freon Products Div. **(R-143)**

NEW CORRUGATED CONTAINERS. A unique brochure which folds into a replica of a Meadomatic shipping container with a pouring spout. Describes these new containers which are designed for automatic packaging of dense or fragile products and are tailored to specific needs. Mead Containers, Div. of the Mead Corp. **(R-144)**

CO-POLYMER PC PRODUCT CONTROL BOXES. Folder describes advantages of these boxes for plant quality production and storage use. Reduce noise, are resistant to dust, fire, chemicals, etc.; extremely tough and will support almost any weight of material either solid or liquid. Panel Control Div. of Export Corp. **(R-145)**

TUBES, BOTTLES, CONTAINERS. 8-page brochure illustrates and contains applications of high density polyethylene linear tubes, epoxy resin L-30 linings, aluminum aerosols and blow-mold bottles. Bradley Sun, Div. of American Can Co. **(R-146)**

SPECIALTY BOXES. Two illustrated bulletins listing line of gift boxes. Special emphasis is given to candy folding boxes. Lebanon Paper Box Mfg. Co. **(R-147)**

FOLDING CHRISTMAS CANDY BOXES. 6-page brochure illustrates line of folding tape handle candy boxes lithographed in high-gloss colors. Lebanon Paper Box Mfg. Co. **(R-148)**

CUSTOM-FORMED PLASTIC PACKAGING. Illustrated 4-page folder describes Panta-Pak plastic containers which can be formed to almost any product contour as a package unit or a tray within another container. Panta-Pak Div. of the Pantasote Co. **(R-149)**

PLASTIC VIALS & JARS. 4-page brochure illustrates line of stock rigid polystyrene molded vials, squat jars and flexible vials and extrusions. Includes cylindrical telescope boxes, oil dispensing tubes, sleeves. Celluplastics, Inc. **(R-150)**

PLASTIC CONTAINERS. Extruded plastic containers in a variety of sizes, closures and colors are featured in a four-page folder which also includes types of scabbards and slides. Extruded Plastics, Inc. **(R-151)**

FRUIT TRAYS. 4-page brochure describes and gives complete specifications of a protective fruit tray that has custom-formed cavities for each variety of fruit. Panta-Pak Div., Pantasote Co. **(R-152)**

AUTOMATIC LOCKING CARTON. Folder shows in pictures patented Lok-Box and how it snaps shut and locks automatically to avoid pilferage, steel strapping, or crating. Consists of a regular slotted container and a bottom tray and a top tray with two cardboard end-locks. Easy to open with nylon teartabs, the lock-box is reusable. Massillon Container Co. **(R-153)**

CUSTOM-MADE CORRUGATED BOXES. Illustrated folder describes components for a box-making system that permits you to make corrugated boxes in plant as needed. System includes box-maker, slitter-scorer, and taper. Colt Packaging Machinery Co. **(R-154)**

PAPER BOXES AND LABELS. Illustrated 6-page catalog describes wide line of stock, round and rectangular, set-up paper boxes, including telescope, slide, hinged and shoulder types. E. N. Rowell Co. **(R-155)**

TRANSPARENT PLASTIC BOXES. 4-page illustrated brochure gives general information on complete line of transparent plastic boxes. Advantages, sizes listed. Vlchek Tool Co., Plastics Div. **(R-156)**

FOOD CONTAINERS. Illustrated 4-page catalog of pressure formed, styrene containers for fresh and frozen foods; includes physical and chemical properties, weights, etc. Also information about multi-color graphics. J. E. Plastic Mfg. Co. **(R-157)**

VIALS AND TUBES. Illustrated 8-page folder describes a line of resilient, shatterproof, transparent or opaque plastic vials or tubes made by injection molding, extrusion and other methods, depending on end use and volume. Liquid capacities from ¼ to 3 fl. ozs. Lusteroid Container Co. **(R-158)**

PAILS & DRUMS. 6-page illustrated brochure describes line of steel pails and drums; also fibre drums. Complete description, advantages, applications, other data. Bennett Industries Inc. **(R-159)**

HEAVY DUTY PACKAGING. An illustrated 6-page brochure diagrams the basic types of package constructed of a triple-wall corrugated. This method fills the gap between the ordinary corrugated containers and the wooden crate. Engineering services available. Tri-Wall Containers, Inc. **(R-160)**

CORRUGATED BOXES. Kit contains twelve illustrated booklets on corrugated cartons. Included are booklets on: labor costs, sealing, stacking and loading, merchandising, air shipping, specification of boxes, printing, prepacking, display stands, testing, and shipping heavy products. Hinde & Dauch Div., West Virginia Pulp & Paper. **(R-161)**

CORRUGATED BOXES. 30-page illustrated book is factual guide on how to pack in corrugated boxes. Covers regular slotted boxes; overlap, full flap, center special slotted boxes, etc. Information on special box designs. Hinde & Dauch Div. West Virginia Pulp and Paper. **(R-162)**

FIBREBOARD CONTAINERS. 4-page illustrated folder describes line of fibre and transparent containers; fibre, metal and plastic closures; also spiral wound tubing. Many sizes and types. Specifications are given. Cleveland Container Co. **(R-163)**

ALUMINUM AEROSOL CONTAINERS. 8-page folder describes seamless aluminum aerosol containers suitable for hair sprays, nasal or throat sprays, cologne, or deodorant. From ½ to 4 fl. oz., with plain, coated or decorated finishes. Peerless Tube Co. **(R-164)**

FLAGONS AND BOTTLES. 48-page catalog describes and illustrates a line of spill-proof flagons, caps, jars, and bottles. Features specially designed caps for a variety of product applications. The Richford Corp. **(R-165)**

FIBRE CANS AND CONTAINERS. 4-page brochure illustrates and gives important information about spiral-wound fibre cans and containers for a variety of product adaptations. Variety of closures included. Sonoco Products Co. **(R-166)**

FOLDING CARTONS. Spiral-bound 30-page booklet describes a line of automatic folding box and paper converting machinery for the graphic arts industry. Thomson-National Press Co., Inc. **(R-167)**

MOLDED PULP PRODUCTS. 28-page catalog describes a wide selection of molded products, including paper-type pie plates, cake circles, and other shipping aids, plus other molded items. Keyes Fiber Co. **(R-168)**

FIBRE DRUMS. 4-page folder illustrates and gives description of a new fibre drum with molded fibre cover and bottom. Accommodates shipping weights up to 500 pounds. Features easy opening and closing. The Greif Brothers Cooperage Corp. **(R-169)**

MAILING BOXES. Folder describes and gives dimensions of a variety of parcel-post shippers that require no tying, sealing, or wrapping. Globe Paper Box Co. **(R-170)**

COLLAPSIBLE BOXES. A 70-page spiral bound book illustrates a variety of collapsible boxes and includes practical information for solving a variety of collapsible box problems. International Paper Box Machine Co. **(R-171)**

POLYETHYLENE CONTAINERS. 4-page brochure illustrates and describes a wide range of high-density polyethylene containers available for a variety of product applications. Containers are designed and custom printed. Hyspec Hydrocarbon Chemicals Inc. **(R-172)**

PLASTIC MOLD PACKER. 6-page folder illustrates the many uses of Mold-Pak, describes its advantages, packaging and shipping. Made of polystyrene foam plastic, it is adaptable to a wide variety of product packaging. Packaging Corp. of America. **(R-173)**

AEROSOL DISPENSING. 14-page booklet illustrates and gives important information about aerosol valves and containers; variety of designs, adaptable to a wide range of aerosol products. Discusses new meter spray valve for cosmetics and pharmaceuticals. The Risdon Mfg. Co., Aerosol Div. **(R-174)**

SELF-SEALING CARTONS. 8-page brochure gives important information about corrugated boxes that require no gluing, no taping, no stitching. Carton has self-sealing adhesive already applied to its flaps. Operator simply presses flaps down for closure. St. Regis Paper Co. **(R-175)**

COLLAPSIBLE TUBES. Spiral-bound 32-page catalog illustrates the wide variety of collapsible metal tubes, both in standard and custom design styles. Discusses important tube design factors, applicator tips and gives specifications. A. H. Wirz Inc. **(R-176)**

PLASTIC CONTAINERS. Bulletin illustrates wide variety of products that can be packaged in pre-formed clear plastic. Primarily for foods, the plastic packaging is waterproof, greaseproof and temperature resistant. Hopple Plastics, Inc. **(R-177)**

POLYETHYLENE CONTAINERS. 4-page brochure describes and illustrates lightweight cylindrical polyethylene drums in five-gallon to fifteen-gallon sizes. A variety of closures and overpacks are included. Delaware Barrel and Drum Co. **(R-178)**

PRESCRIPTION CONTAINERS. 4-page data file describes and illustrates glass prescription containers, both clear and amber types. Capacity and other data included. Brockway Glass Co. Inc. **(R-179)**

GLASS VIALS. 4-page brochure illustrates and gives specifications of a full line of stock-size and special glass packers' vials. Demuth Glass Works Inc. **(R-180)**

PLASTIC CONTAINERS. 4-page folder illustrates and gives important data on a full line of variously styled plastic containers. Includes bottles, jars, with choice of closures, dispensers, and fitments. All-Pak Inc. **(R-181)**

STAY BOXES. Folder describes and gives data on a variety of metal stay boxes. Dimensions and suggested uses given. The Cincinnati Box and Partition Co. **(R-182)**

CORRUGATED CONTAINERS. 32-page book describes and illustrates a variety of corrugated containers. Discusses typical applications for each style. Olin Packaging Div. **(R-183)**

CARTONS. 10-page booklet describes in detail a carton service designed to provide cartons with exact uniform construction to suit a specific application. Includes discussion of design, research, and development. Olin Packaging Div. **(R-184)**

PLASTIC CONTAINERS. 6-page folder describes a variety of plastic containers and their special benefits in packaging and shipping. Plax Corp. **(R-185)**

CONTAINERS AND TUBING. 4-page folder describes a basic line of containers, closures and packaging tubing. Specifications given with suggested applications. The Cleveland Container Co. **(R-186)**

TUBULAR PACKAGES. 6-page fold-out brochure illustrates and gives detailed information about the design and manufacture of a variety of tubular packages including gooseneck, dispenser, telescopic and novelty types. Niemand Bros. Inc. **(R-187)**

CANS AND TUBES. 4-page brochure illustrates and gives important information on a wide variety of packaging and mailing fibre cans and tubes. Describes selection of closures and interior and exterior linings. Cin-Made Corp. **(R-188)**

CAST COATED BOXBOARD. Spiral-bound brochure describes and gives a variety of samples in color of Glosscoat, the first on-machine cast coated boxboard. Gives specifications and data. The Interstate Folding Box Co. **(R-189)**

BOX AND PARTITIONS. Folder describes a variety of boxes and partitions including middle stay box and their components. The Cincinnati Box and Partition Co. **(R-190)**

METAL EDGE METHOD. 8-page brochure describes wide advantages of using fibreboard boxes strengthened with metal edges stays. Illustrates and describes a variety of container applications. Metal Edge Industries. **(R-191)**

METAL STAYS. 10-page booklet describes "the metal edge method" which saves space and reduces waste in addition to providing an efficient flexible system of assembling metal edge boxes from slats on a metal edgestaver as they are required. Consists of flaps, stayer and stay engineered to customer requirements. Metal Edge Industries. **(R-192)**

COLOR PRINTED CARTONS. 4-page brochure gives important information about product identification in color on the outside of shipping cartons called Preprint. The process reproduces labels or other identification for a wide variety of uses. Container Div., St. Regis Paper Co. **(R-193)**

BOX-COLOR SELECTOR. A dial-type selector provides easy selection for colors of metal corner stay and boxboard combinations. Specifications and data given. The Cincinnati Box and Partition Co. **(R-194)**

VISUAL PACKAGING. Packaging idea kit contains individual illustrated bulletins on plastic blisters and trays, blister packaging, flexible film packaging, blister cards and skin packaging. The American Packaging Corp. **(R-195)**

PRODUCTS CATALOG. 26-page fully illustrated catalog gives complete specifications and costs of products available, such as loose-leaf binders, bill tote, card case, etc. Sirco Mfg. Corp. **(R-196)**

PAPERBOARD CONTAINERS. 30-page brochure covering the manufacturing opportunities in Georgia. Contains a summary of the southeastern markets, special food board products and new paperboard products. The Georgia Department of Commerce. **(R-197)**

ACETAL RESIN FOR AEROSOLS. 6-page folder discusses use of acetal resin for aerosol packages. Advantages are that acetal resin can be molded economically into almost any desired size and shape, good colorability, freedom from corrosion. Polychemicals Dept., E. I. DuPont de Nemours & Co., Inc. **(R-198)**

STEEL DRUMS, PAILS. 14-page illustrated brochure describes line of steel shipping containers, ranging from 3¾ gal. 26 gauge lug-cover pails to 55 gal. 12 gauge all-welded acid drums. Republic Steel Corp. **(R-199)**

Package Components (Closures, Seals, Partitions, Liners, etc.)

MOLDED CAPS. 4-page brochure describes a line of molded caps which feature a liner retaining ledge which holds liner permanently captive. Anchor Hocking Glass Corp. **(R-207)**

BOTTLE CLOSURES. Reference file illustrates and gives extensive information on a full line of bottle closures including pilfer-proof seals. Description of automatic sealing machines also included. Metal Closures Ltd. **(R-208)**

CAN, BOTTLE CAPS. Illustrated sheet covers one-piece can and bottle caps that offer positive, self-lock seal. The Dover Molded Products Co. **(R-209)**

FITMENT APPLICATOR. Data sheet describes fitment applicator operating as an independent machine. Handles solid or perforated fitments, with or without lift tabs. Resina Automatic Machinery Co., Inc. **(R-210)**

PROTECTIVE PACKAGING. 8-page illustrated brochure discusses features of custom-made fluted cardboard partitions which hold and cushion any small, fragile object such as an ampule, an electronic tube, a highly polished lipstick case, etc. Rondo of America, Inc. **(R-211)**

OPENING DEVICES. 16-page booklet illustrates line of low-cost, effective zip-opening devices for modern flexible packages. Features Zip-Tape, Zip-String and Zip-Strip. The Dobeckmun Co. **(R-212)**

AEROSOL AND JAR CAPS. Two reference cards illustrate a representative selection of Aerosol Protective domes and Unishells for jars, breasted cans and Crown Drawn Cans. Sterling Seal Co. **(R-213)**

INTERIOR PACKAGING. 12-page booklet describes and illustrates "Kimpak" internal packaging. Gives specifications, characteristics and examples of uses. Kimberly-Clark Corp. **(R-214)**

PROTECTIVE CUSHIONING. Sample file with data sheets which illustrate and describe Sof-Rap exterior, interior flexible cushion wrap for storage and shipping safety. Examples of uses are included. Nichols Paper Products Co. **(R-215)**

PROTECTIVE PACKAGING. Data sheet describes a resilient, durable product cushion, available in any thickness and density, molded to fit product shape. Lists typical applications. Janesville Cotton Mills. **(R-216)**

PACKAGE CUSHIONING. 10-page booklet describes a new cushioning made from selected polystyrene beads. It is lightweight, non-corrosive and odorless. Physical property table and other data included. Armstrong Cork Co. **(R-217)**

INTERLOCKING PARTITIONS. 4-page folder describes pre-assembled interlocking partitions, that reduce dust problems and packaging slowdowns. Data and specifications included. American Partition Co. **(R-218)**

CELLULOSE WADDING. Illustrated folder with samples describes cotton wadding for surface protection and for cushioning. General description, detailed data, advantages, other information. The Stearns & Foster Co. **(R-219)**

FLUTED PARTITIONS. 12-page booklet that describes a system of fluted partitioning, for safe handling, conveying, shipping and displaying small, delicate products and components requiring partitioned separation. Rondo of America. **(R-220)**

Labels, Seals, Tags

STENCIL LABELS. A 4-page folder describes a new method for addressing multiple shipments. Stencil is typed then applied to a bottle applicator. Folder gives instructions and sample applications. Sten-C-Labl Inc. **(R-230)**

SHIPPING TAGS. 6-page brochure and sample book describes and shows in color a variety of string and wire attached tags. Specifications and typical applications. American Tag Co. **(R-231)**

AUTOMATION LABELATION. 30-page portfolio features 29 prize-winning automation labelation ideas. Labels pin-feed pressure-sensitive in relation to data-processing machines. Alan Hollander Co., Inc. **(R-232)**

PRESSURE-SENSITIVE LABELS. Extensive data file describes the many advantages and applications and gives samples of new double and triple pin-feed pressure-sensitive labels specially suited for data-processing equipment. Alan Hollander Co., Inc. **(R-233)**

CUSTOM PRINTED LABELS. 4-page brochure illustrates a wide selection of labels and their application. Includes samples and description of design and production facilities. Paramount Paper Products Co. **(R-244)**

TAGS AND LABELS. A complete spiral-bound catalog illustrates and describes tags and pressure sensitive labels. Catalog is indexed and in full color gives data and accessories. Labels available in a variety of stocks and colors. The National Tag Co. **(R-245)**

LABEL PAPERS. Swatch book of label papers in a variety of weights, finishes and colors. Paper and adhesive react to atmospheric changes and moistening by contracting and expanding at same rate, remaining flat. Nashua Corp. **(R-246)**

LABEL PAPERS. 16-page sample book contains sample swatches plus data and important information about water moistenable label papers. Nashua Corp. **(R-247)**

SEALS AND TAGS. Illustrated folder describes five ways in which seals and tags help to sell your product. Suggested sizes and shapes, general description, other data. Stoffel Seals Corp. **(R-248)**

Printing, Converting Equipment and Supplies

IMPRINTING MACHINES & ATTACHMENTS. Descriptive 4-page folder contains package imprinting selector chart and details on web printer, top and bottom coders, case marker and box and carton printer. Gottscho. **(R-258)**

PRINTING INK. 4-page bulletin outlines printing ink service available for lithography, letterpress, flexography and rotogravure. Crescent Ink & Color Co. **(R-259)**

MARKING AND LABELING. 6-page folder describing effective, economical methods, machines, type and ink for marking, labeling, decoration and product identification. Complete information for exact specifications and applications available. Markem Machine Co. **(R-260)**

ROTOGRAVURE PRESSES. 16-page booklet illustrates rotogravure printing presses for printing of packaging material, featuring rugged construction, modern style and centralized controls. Includes specifications. Cerutti Presses of America, Inc. **(R-261)**

IMPRINTING MACHINES. A booklet describing two versatile high-speed imprinting machines to code, number, mark or imprint paper items and cartons with product information, dates, batch codes, prices, etc. Shows speeds, specifications, materials. Pitney-Bowes, Inc. **(R-262)**

VACUUM PRINTING PLATE CLEANER. 4-page brochure shows plate cleaner which pumps exact amount of cleaning fluid from a specially designed agitator that cleans the plate thoroughly, vacuuming waste materials into separate compartment. Eliminates immersion tank, brushes and increases life of plates. E. L. Harley Inc. **(R-263)**

SCREEN PRINTING. Illustrated data sheet describes screen printing machine for cylindrical and sphere objects of glass, metal, all plastics, wood and rubber. Specifications, dimensions, etc. Dependable Compressor & Machine Co., Inc. **(R-264)**

COLOR FOR PACKAGE PRINTING. 4-page guide to use of color for package printing. Includes charts of colors, how to choose inks for package printing. Interchemical Corp., Printing Ink Div. **(R-265)**

ROLL LEAF MARKING. 3 illustrated pages describe features and applications of equipment and process of engraving designs or lettering in color onto various surfaces such as paper, cloth, textiles, leather, plastics, etc. Specifications and data. Peerless Roll Leaf Co., Inc. **(R-266)**

ROLL HANDLING EQUIPMENT. 82-page catalog of line of roll handling equipment. Illustrations, specifications are given for many unwind stands and rewinds. Champlain Co., Inc. **(R-267)**

MARKING MACHINES. 4-page colored brochure describes a pressure-sensitive roll label imprinter that has been coupled with a pressure-sensitive roll label applicator. Also their conveyor-feeding unit for bags, sacks and pouches. The Monarch Marking System Co. **(R-268)**

AIR JET. Pamphlets describe an air jet for fast evaporation of solvents and water. Includes illustration of its installations in flexographic and rotogravure presses. Comac Engineering, Inc. **(R-269)**

FLEXOGRAPHIC PRESSES. 8-page illustrated booklet describes three color flexographic stack press, narrow web flexographic press, two and four color flexographic presses, high speed bag machine, rewinder and slitter. Manhasset Machine Co., Inc. **(R-270)**

INKS. Three new colors of letterpress and litho inks (Fire Orange, Saturn Yellow and Neon Red) are included with seven other printing ink colors in color guide. Both one and two impression effects of each color are shown. Switzer Brothers, Inc. **(R-271)**

PRINTING PRESSES. 8-page brochure illustrates and describes in detail a line of printing presses able to complete every required printing and finishing operation with one run. Jobs handled include labels, tags, forms, tickets, data-processing cards. New Era Mfg. Co. **(R-272)**

AUTOMATIC PRINTER. 4-page brochure illustrates and gives description of a compact marking machine that prints, die cuts, renews waste and rewinds pressure-sensitive labels. Adhesive Label Corp. of America. **(R-273)**

STEP AND REPEAT MACHINE. Data sheet describes automation-controlled step and repeat machine for letterpress, lithography and rotogravure. Gives specifications for film and plates together with other data. Royal Zenith Corp. **(R-274)**

COLOR PRINTING. 4-page brochure describes and shows examples of new color printing facilities available for a wide variety of packaging requirements. Rossotti Lithograph Corp. **(R-275)**

STATIC ELECTRICITY. Illustrated folder describes aerosol bomb spray that offers simple, quick, effective relief from static electricity to the printing industry and other fields. Statikil, Inc. **(R-276)**

POWER PRESSES. 4-page folder illustrates and gives important information on ¾ ton to 7 ton presses. Lists variety of uses, accessories and controls. Olsenmark Corp. **(R-277)**

SHEET CUTTER. 4-page brochure illustrates line of sheet cutters for paper, board, metals, films, plastics and textiles. Specifications and sheet length data chart included. Charles Beck Machine Corp. **(R-278)**

WINDING EQUIPMENT. Spiral-bound 14-page booklet illustrates and discusses in detail a variety of modern winders with accessories. Models shown include fixed shaft and turret pointers. Diagrams and specifications included. Hobbs Manufacturing Co.—Machine Div. **(R-279)**

AUTOMATIC SPRAY MACHINE. Illustrated data sheet describes single vertical fixture automatic spray machine that offers adjustable length and speed of painting stroke. Automatic air filtering, cylinder and air valve lubrication, water trap ejector. Handy reference chart lists spray painting troubles and remedies. Conforming Matrix Corp. **(R-280)**

SPRAY MACHINE. 2-page illustrated bulletin on an air operated automatic single spindle rotary spraying machine with vertical traveling guns for finishing cylindrical and rectangular parts. Also available with mask washer and spray booth. Conforming Matrix Corp. **(R-281)**

SPRAY PAINTING MASKS. 4-page illustrated folder describes electro-formed metal spray painting masks for multiple color decoration and protective coatings. Covers lip-type masks, plug-type masks, plane surface masks. Conforming Matrix Corp. **(R-282)**

SLITTER-REWINDER. 2-page illustrated data sheet gives specifications and description of slitter-rewinder designed for converting acetate, butyrate, cellophane, mylar, nylon, PE, polypropylene, polystyrene, teflon and triacetate films. John Dusenbery Co., Inc. **(R-283)**

AUTOMATIC CONTROLS. 16-page booklet illustrates and describes various web-guiding systems and their applications in plastics, paper, textile and other industries. Controls feature non-contact detecting heads and ease of installation. GPE Controls, Inc. **(R-284)**

SLITTER-REWINDER. 4-page descriptive brochure contains specifications and illustrations of versatile center winding slitter-rewinder for handling plastic films, foils, papers, laminates and other materials. Cameron Machine Co. **(R-285)**

SLITTER AND REWINDER. 8-page illustrated catalog contains specification data on razor blade slitter and rewinder with slitting widths ranging upward in ¾" steps from a minimum width of ¾", and parent roll capacity of 28" diam., rewind roll 14" diam. Includes available attachments. Charles Beck Machine Corp. **(R-286)**

SLAT EXPANDER. Data sheet illustrates and gives important information about an anti-wrinkle slat expander that eliminates wrinkles in plastic films and fabrics during continuous roll operation. Speeds production and improves printing quality. Kay Machine Co. **(R-287)**

POLYETHYLENE PRINTING. 16-page technical data file discusses detailed methods of treating and printing on polyethylene. Lists equipment and inks available. U. S. Industrial Chemicals Co., Div. of National Distillers and Chemical Corp. **(R-288)**

LITHOGRAPHIC PRESSES. 6-page brochure gives data and description of a 43 in. x 60 in. folding carton lithographic press. Advantages are that it controls own design, assures stability during function of feeding and registering, inking and delivery. Harris-Seybold Co. **(R-289)**

CARTON MARKER. Data sheet describes and gives specifications of an automatic coder for all packaging machines, carton sealers, and conveyors. Imprints automatically during packaging operation. Cozzone Marking Co., Inc. **(R-290)**

AUTOMATIC CODER. Bulletin describes an automatic printing machine for code-dating the bottom surface of a container with a sharp, clear imprint. Handles wide variety of containers, including concave or flat-bottom types. Cozzone Marking Co., Inc. **(R-291)**

NEW PACKAGE MARKER. Data sheet illustrates and gives important information about an automatic package printer. Mounts on packaging machinery and processing equipment to code materials in continuous strips, webs, or sheet form. Cozzone Marking Co., Inc. **(R-292)**

PERFORATING MACHINE. Technical data sheet describes easy-to-operate perforating machine for a wide variety of materials, including sheet film, leather, and coded cardboard. Robert A. Main & Sons, Inc. **(R-293)**

TICKETING MACHINE. Folder describes a label marker for either two lines of type marking, or two lines of type marking plus two lines of dial marking, on a standard four-line label. Soabar Co. **(R-294)**

PRINTING PAPER PLANNER. Comprehensive guide-wheel paper selector indicates stocks and weights best suited to particular printing jobs, literature, catalogues, etc., with grade selector for letterpress, offset, gravure, and others. Champion Paper & Fibre Co. **(R-295)**

FLUORESCENT COLOR INKS. Technical bulletin describes in detail fluorescent color letterpress inks. Includes color swatches and detailed instructions. Switzer Bros. **(R-296)**

PRINTING PRESSES. 8-page brochure shows a wide variety of printing jobs that can be accomplished on multi-process press. Illustrates and gives specifications of the presses, tells how presses complete the product in one run. New Era Mfg. Co. **(R-297)**

MARKING EQUIPMENT. 6-page folder describes and illustrates complete line of roll leaf stamping equipment, featuring a variety of pressure ranges and fast production. Olsenmark Corp. **(R-298)**

MULTI PURPOSE MARKER. 4-page folder describes self-stop ticket and label markers for product identification, production control, pricing and shipping, among other uses. Gives examples of its wide application. Soabar Co. **(R-299)**

FILM PRINTER. 4-page brochure illustrates and describes a film printer that is a flexographic press for all films. Lists features and specification tables. Kidder Press Co., Inc. **(R-300)**

MARKING AND NUMBERING MACHINES. 14-page booklet describes a full line of marking and numbering machines with supplemental items including stamps, dies, engraving, nameplates, tablets, signs, foils and inks. Acromark. **(R-301)**

PRINTING POLYETHYLENE. 16-page technical service bulletin discusses treating of surfaces, tests relating to treatment

and adhesion, decorating, materials, sources of supply. Includes data on silk screening, hot stamping, transfer labeling, and offset printing of polyethylene. W. R. Grace & Co., Polymer Chemicals Div. (R-302)

Packaging Line, Package-Making and Specialty Equipment

AUTOMATIC WRAPPING AND PACKING. 4-page brochure illustrates and gives diagram of how Trimatic automatically loads, glues, wraps and packs. Brochure gives specifications and special advantages of Trimatic. Wrapmatic (R-313)

SHIPPING CASE INTEGER, 4-page folder describes machinery to handle complete casing operation. Strips a knocked-down case from a stack of flat cartons, sets it up, presents it to a packer. When packed, glues and seals it. Specifications. Emhart Mfg. Co. (R-314)

FILLING EQUIPMENT. Illustrated 8-page folder gives specifications of automatic and semi-automatic fillers; shows seven basic types of augers and optional accessories for filling equipment. FMC Corp. (R-315)

PACKAGING MACHINERY. Illustrated folder describes line of packaging machinery from carton filling & sealing equipment, pouch forming, contour wrapping, box & tray forming, set-up box equipment to double-package makers. FMC Corp. (R-316)

AUTOMATIC WRAPPER. 12-page booklet illustrates automatic rotary wrapper which packages products at speeds up to 300 units per minute, using kraft and wax papers, cellophane, foils, polyethylene, pliofilm, etc. FMC Corp. Hudson-Sharp Machine Co. (R-317)

STRIP SEALER. Data sheet illustrates and gives description of an automatic machine for strip packing of liquids, pastes, powders, small objects. It forms folds and seals, features twin thermostatic control. Mercury Heat Sealing Equipment Co. (R-318)

FILLER. Data sheet illustrates and describes an automatic filler with a new sifter. Fills up to 50 packages a minute without breakage or dust or crumbs. Mercury Heat Sealing Equipment Co. (R-319)

BAG-HEADER. Data sheet illustrates and gives a sample of an integrated bag-header package. Supplied with printed header attached ready to load and seal in two steps. Plastic Packaging Co. (R-320)

FILLING MACHINE. 4-page brochure illustrates and describes a vibratory package-filling machine that is semi-automatic. Fills up to 60 units per minute with precision weight accuracy. Stuyvesant Engineering Corp. (R-321)

LABEL HANDLING. 6-page color folder illustrates a semi-automatic labeling machine that uses the suction principle of application. Labels can be applied in recesses, on panels, convex or concave surfaces. New Jersey Machine Corp. (R-322)

FLEXIBLE PACKAGING. 8-page brochure describes a horizontal system for flexible packaging. Diagram and detail information tells how the unit automatically forms, fills, seals in a high-speed operation, a variety of flexible packages. Bartelt Engineering Co., Inc. (R-323)

CONTINUOUS MOTION PACKAGER. 4-page brochure describes a continuous motion packager with horizontal workflow advantages. Diagram describes operation which provides high speed and strong seals for a variety of packaging. Bartelt Engineering Co., Inc. (R-324)

VERTICAL PACKAGER. 4-page brochure describes and illustrates a vertical packager for flexible packaging. Produces pouches at speeds of 40 to 100 per minute yet is compact in size. Bartelt Engineering Co., Inc. (R-325)

LIMIT SWITCHES. 12-page brochure describes and gives diagrams of a full line of limit switches. Called Lox-Switch, they make it possible to equip machines and conveyers with automation. R. B. Denison Mfg. Co. (R-326)

PLASTIC FORMING EQUIPMENT. 4-page brochure describes four basic styles and special features of plastic forming and packaging equipment, designed for automation. Dimensions and typical applications included. Atlas Vac-Machine Corp. (R-327)

PARTS FEEDERS. 4-page brochure describes a new automatic parts feeder. Features a universal bowl to feed all parts. U. S. I. Robodyne Div. of U. S. Industries, Inc. (R-328)

SEMI-SOLIDS FILLER. 4-page brochure illustrates and gives important information about four models for the filling of semi-solids, such as jams, jellies, and soft soap. Features include fully automatic operation, special accessories for specific product packing. F. Burt Co. (R-329)

STATIC ELIMINATOR. Folder describes and illustrates applications of a new static eliminator that is efficient, easy to install, and safe. Herbert Products Inc. (R-330)

STATIC DETECTOR. A technical data sheet illustrates and gives important information on a portable static detector. Tells how the use of the static detector indicates whether operating difficulties are caused by static. Herbert Products Inc. (R-331)

HEAT CONTROL. Technical data sheet describes and gives pertinent data about heat control unit. Provides accurate regulation of all types of heating units up to 3750-watt capacity. Herbert Products Inc. (R-332)

BLOW-MOLDING EQUIPMENT. 4-page brochure describes a line of thermoplastic blow-molding machines. Both standard and custom machines adaptable to any extruder. Acme Machinery and Mfg. Co., Inc. (R-333)

PLASTICS EXTRUDER. 18-page brochure lists and illustrates a line of extruders and auxiliary equipment of plastics. Discusses services, gives data. Sterling Extruder Corp. (R-334)

FORM FILL SEAL. Data sheets illustrate and give important information about a new form-fill seal machine that uses sheet film from roll, plain or shrink type ½ to 3 mil thickness. Pratt Mfg. Corp. (R-335)

PRESSURE FILLER. 14-page brochure describes filling and sealing equipment including a Volumatic pressure filler for continuous filling of viscous and semi-solid products. Biner-Ellison (R-336)

TEMPERATURE CONTROL. Data sheet illustrates and describes a single-zone temperature control unit that is portable or machine-mounted. Pre-heats and maintains constant temperature control. Temperature Equipment Corp. (R-337)

CAM SELECTION. 12-page booklet gives tables and diagrams for simplified selection of cams for a variety of applications. Cams described give high machine speed and long cam life. Ferguson Machine Co. (R-338)

MOLDING SYSTEM. Folder illustrates and gives important information on a new automatic molding system for expandable polystyrene products and packaging. System features centralized control center and short cycles. Expandex Corp. (R-339)

BOTTLE FINISHER. Data sheet describes and gives specifications of a bottle finisher that provides clean, continuous, efficient cutoff, reaming, facing, tempering. Diagram explains sequence of automatic cycle and accurate finishing. The Producto Machine Co., Plastic Machinery Div. (R-340)

BLOW MOLDING. 4-page brochure illustrates and gives important information about single and double press blow molding machines in advanced accumulator designs. Eight different models are available, each with a three-way micro-positioning adjustment. The Producto Machine Co. (R-341)

FEEDER-COUNTER. Folder describes a new parts feeder that feeds, orientates, and counts up to 200,000 items per hour. Handles a variety of products and features quick change-over. Count-O-Matic Inc., Div. U. S. Engineering Co. (R-342)

DIE-CUTTING PRESS. Reference sheet illustrates and gives specifications of a pneumatic die-cutting press that provides die-cutting and heat-sealing in one operation. Features large platen area and up to 100 strokes per minute. Comet Industries, Inc. (R-343)

WRAPPING MACHINE. A high-speed roll wrapping machine wraps 120 packs per minute and handles round tablets, lozenges, and other similar products. Auto Wrappers (Norwich) Ltd. (R-344)

SUGAR PACKAGING MACHINES. 16-page booklet describes automatic packaging machines especially for the sugar industry. Diagrams and illustrations explain how machine handles a variety of packaging operations automatically. Fr. Hesser-Geveke and Co. Inc. (R-345)

PACKAGING MACHINERY. 6-page brochure describes a full line of packaging machinery and systems for paper finishing and converting, finishing of fabrics, coating plastic materials, and other uses. Hofmann & Schwabe. (R-346)

AUTOMATIC LABELER. Reference file describes and lists advantages of a labeler which labels up to 2400 containers per

hour with no operator needed. Automatically feeds labels and rejects. Long and Co. Inc. (R-347)

HEADER BAG. Illustrated data sheet describes a new type of header bag supplied with printed header already attached. Integrated package can be loaded, sealed in two quick easy steps without stapling. Plastic Packaging Co. (R-348)

FILLING EQUIPMENT. 16-page catalog lists a line of filling equipment and accessories designed to streamline a variety of filling operations. Lists specifications and applications. Popper and Sons, Inc. (R-349)

BAGGING SCALES. Data sheet illustrates and gives detailed information about an automatic bagging scale that reportedly gives high speeds and high accuracies. Handles 24 50-pound bags of free-flowing material. Richardson Scale Co. (R-350)

SHEET CLEANER. 4-page brochure describes a patented sheet cleaner which automatically removes dirt, dust, lint, loose edges, and excess dry spray. Lists examples of application and advantages. The J. E. Doyle Co. (R-351)

BAG PACKAGER AND SEALER. 4-page brochure describes a combination of bag packager and auto-bag sealer. Operated by one person, will load and seal bottom gusseted bags. Errich International Corp. (R-352)

BALING PRESSES. 4-page brochure illustrates and gives important information about four all-steel hydraulic baling presses for bags, bolt goods, clothing, plastics, tobacco, and other products. Consolidated Baling Machine Co. (R-353)

SEMI-AUTOMATIC LABELER. Illustrated brochure describes a versatile labeler that will handle all sizes and shapes of containers from ampules to gallons. Brochure gives specifications capacity. Atlas Labeling Machine Corp. (R-354)

EXTRUSION COATERS. 8-page brochure illustrates and gives specific structural data of extruder and dye equipment, laminator and auxiliary equipment. Extrusion coaters are built for speeds up to 1500 fpm and provide a wide range of coating thicknesses. Frank W. Egan and Co. (R-355)

CAN SORTERS. 8-page illustrated booklet describes line of automatic can sorters and uncasers. Also includes four-flap case opener. Complete descriptions, schematic diagrams, specifications, other data. Atkron, Inc. (R-356)

UNCASING MACHINERY AND EQUIPMENT. 6-page illustrated folder describes features of a line of equipment designed for the uncasing of bottles in the 6 to 32 oz. range . . . from 3-wide and 4-wide half-depth cases. Handles all cardboard, and most metal carry-home cartons. Atkron, Inc. (R-357)

NET WEIGHT PACKING SCALE. 4-page brochure illustrates this five-pound capacity net weight packing scale which is designed for check-weighing, filling, issuing predetermined quantities and for various count-by-weight operations. Toledo Scale, Div. of Toledo Scale Corp. (R-358)

DRIVE CONTROL AND REGULATORS. 16-page folder describes features of equipment designed to operate controls, changes, and regulate motor speeds, horsepower and torque. Reliance Electric & Eng'g. Co. (R-359)

COATING AND LAMINATING EQUIPMENT. A 6-page binder insert illustrates equipment for extrusion coating and laminating including an integrated web process system. Diagram shows automation principle and simplicity of operation. Waldron-Hartig. Div. of Midland-Ross Corp. (R-360)

GLUING, CEMENTING. Illustrated folder describes line of gluing, cementing, coating and laminating machines. For all types hot and cold glues, latex, varnishes, lacquers, resins, paints, thermoplastics. General information, specifications, typical applications. Potdevin Machine Co. (R-361)

LIQUID FILLING MACHINES. 8-page brochure describes, illustrates, and gives specifications for line of liquid filling machines, including rotary filling machines, semi-automatic filling machines, gravity fillers, nitrogen depositing machines, "bottom up filler" and accessories. MRM Co., Inc. (R-362)

FILLERS. 8-page illustrated brochure describes complete line of fillers for liquids and semi-liquids. Covers gravity fillers, gravity-vacuum fillers, gravity fillers for cans and jars. Advantages, applications, general information. The Horix Mfg. Co. (R-363)

LAMINATOR. Bulletin sheet describes and gives picture of machine for the lamination and coating of such materials as aluminum foil, light to heavy grades of paper, paper board and plastic films. Available in any width up to 65" working web width. John Dusenbery Co., Inc. (R-364)

BLISTER PACKAGING. 24-page booklet of information for users of blister packages. Booklet includes sections on growth and advantages, selecting the right thermoform, plastic, stock, printing process, ink, products successful in blister, skin and slide packs, etc. The Jackmeyer Corp. (R-365)

MOLDING MACHINES. 60-page engineering catalog describes plastic injection molding machines that offer quicker, lower-cost development and steady, moderate production of various small one-third oz. to one oz. items. Outstanding advantages, applications, specifications, are detailed. Newbury Industries, Inc. (R-366)

CASE PACKER. Illustrated folder describes continuous motion case packer which packs up to 30 cases per minute. Interchangeable heads pack all bottles or cans in single or multiple layer cases. Atkron, Inc. (R-367)

UNITIZED LOAD HANDLING. 8-page illustrated booklet describes economical method of unitized load handling. Other data. The Mead Corp. (R-368)

HIGH PRESSURE EXTRUDERS. Illustrated folder describes induction heated, controlled high pressure extruders that offer uniform induction heat, fast heat-up, push-button pressure control. Advantages, applications, other data are included. Blaw-Knox, Aetna-Standard Div. (R-369)

BOX CLOSING. 36-inch x 24-inch wall chart illustrates simplicity of box closing using a single strip application of reinforced sealing tape. Also provides instructions concerning recommended storage and handling of reinforced tape. Atlantic Gummed Paper Corp. (R-370)

WRAPPING MACHINES. 4-page illustrated brochure describes machinery that forms a bag; holds bag open for loading; closes bag; seals, forms and delivers. Only one operator required. Cycling speed: 30 per minute. Stephen Bodolay Inc. (R-371)

CAN SORTERS AND UNCASERS. 10-page illustrated brochure gives specifications for several can sorters, feeding bin, automatic uncaser, case packer, case opener and other materials handling equipment. Atkron, Inc. (R-372)

STATIC. 4-page illustrated folder describes equipment that improves machine production by eliminating static. Output is smooth and uninterrupted, quality of work is improved. Advantages, technical data and installation information. Herbert Products Inc. (R-373)

ELECTRIC PACKER. 6-page illustrated folder describes multiple-speed electric counter and packer that features variable-speed, rotating, counting disc; adjustable tilt table; two independent vibrators. Complete information, average production schedule charts, other data. Fairchild's Inc. (R-374)

PLASTICS EXTRUDERS. 8-page illustrated booklet describes line of plastics extruders in 3½", 4½" and 6" sizes. Greater thrust and horsepower capacity, versatile modular construction, other advantages. National Rubber Machinery Co. (R-375)

TABLET COUNTING & FILLING MACHINE. Literature describes machine that counts tablets and capsules, and fills them into vials or bottles at speeds up to 1200 containers per hour. The Burnet Co. (R-376)

TABLET PACKAGING MACHINERY. 6-page fold-out illustrates and gives brief description of tablet packaging machinery including unscrambling table, tablet counting machines, bottle feed for tablet counters, etc. Production Equipment, Inc., Div. of Burnet Co. (R-377)

ELECTRIC TACHOMETERS. Illustrated 4-page brochure describes a line of electrically actuated tachometers in a variety of ranges and types. Special scales for indicating rate of packaging at no extra cost. Electro-Mechano Co. (R-378)

PRESSURE FORMING. Illustrated brochure which outlines Plaxall's 25 years in the pressure forming field. Explains plastic sheet extrusion facilities from raw resins to formed plastic packages. Plaxall Inc. (R-379)

PHARMACEUTICAL PACKAGING EQUIPMENT. Illustrated 6-page fold-out on tablet and capsule counters, cottoning machines, tablet inspection machines, tablet cleaners, feeder and special-purpose packaging equipment. Lakso Co., Inc. (R-380)

CAN SEALING MACHINE. 5-page illustrated brochure describes line of automatic can sealing machines, features and

applications, with handling capacity up to 120 units per minute, sizes up to 1 gallon. Newman Tool Co., Inc. **(R-381)**

CASE GLUER. Illustrated 4-page brochure describes glue line system to replace glue pots, rollers, and their driving mechanisms. System feeds glue under light air pressure from the reservoir through an applicator directly onto the case flaps. Emhart Mfg. Co. **(R-382)**

AIR & LIFT TABLES. 4-page folder describes features of air and lift tables designed for easy station-to-station movement of paper, film, foil, board packs, etc. For use with other processing and handling equipment. The Clark-Aiken Co. **(R-383)**

VACUUM FILLER. Product bulletin describes portable vacuum filler for filling free-flowing and semi-viscous liquid, light or heavy, foamy or syrupy. Useful to short run packagers as well as to test market packagers. Economic Machinery Co., Div. Geo. J. Meyer Mfg. Co. **(R-384)**

TABLET, CAPSULE FILLER. Illustrated bulletin describes automatic continuous motion tablet and capsule filler. 15,000 tablets per minute or 150 bottles of 100's. Lakso Co., Inc. **(R-385)**

WRAPPING MACHINES. Seven illustrated catalog sheets describe automatic wrapping machines for overwrapping round, square and many irregular shaped items such as candy, bakery goods, typewriter ribbons, bearings, tapes, deodorant, cakes, butter patties and similar products. Uses variety of materials—films, foils and paper. Crompton & Knowles Packaging Corp. **(R-386)**

PLASTICS FORMING MACHINES. Series of illustrated specification sheets describe a line of straight vacuum, plug-assist and drape-forming machines and combination types. Emhart Mfg. Co. **(R-387)**

COMPACT STATIC CONTROLS. Data sheet illustrates and describes patented static control that guarantees static elimination. Features balanced electronic design and positive controlled current at all speeds. The Takk Corp. **(R-388)**

STATIC ELIMINATORS. Data sheet describes static eliminator unit for single machine installations. Features two rows of emitting points with patented control discharge method. The Takk Corp. **(R-389)**

WIDE CROWN STAPLE. 4-page illustrated folder describes time and labor-saving features and applications of wide crown staple. Illustrates and gives specifications of eight hand operated and air operated staplers. Bostitch **(R-390)**

VACUUM FORMING MACHINES. 4-page brochure gives specifications and illustrations of 4 vacuum forming machines which handle polyethylene, polystyrene, acetate, vinyl, butyrate and all other thermo-forming plastics. Mold making facilities also available. Plasto-O-Craft Co., Inc. **(R-391)**

PLASTIC FILM & SYNTHETIC FABRIC SEALER. 2-page data sheet gives details and illustrates sealer which permanently welds polyethylene, polypropylene, nylon, and synthetic fabrics without adhesives, chemicals or high voltage. Ultra Sonic Seal, Inc. **(R-392)**

POLY PACKAGING MACHINE. Data sheet describes the Amscomatic "75" poly packaging machine designed specifically for plants whose packaging requirements are met by the use of 1 or 2 bag loaders; and for plants with decentralized packaging requiring compact equipment at several locations. Includes specifications of this edge-sealed poly package machine. Amsco Packaging Machinery, Inc. **(R-393)**

POLY PACKAGING UNITS. 6-page brochure gives applications, advantages and specifications of Amscomatic "100" packaging units, producing a finished package which is fine-line edge sealed on 3 sides, eliminating center-seams, end-folds, etc. resulting in double-faced package with unobstructed visibility. Amsco Packaging Machinery, Inc. **(R-394)**

UNLOADER & UNSCRAMBLER FOR BOTTLES OR JARS. 4-page folder gives complete specifications and illustrations of this machine which is adjustable to a wide range of case sizes, for all single tier packing arrangements, with a capacity of up to 30 cases a minute. Handles most all glass containers. A-B-C Packaging Machine Corp. **(R-395)**

SEMI-AUTOMATIC CASE PACKER. Data sheet contains comprehensive specifications and detailed description of operation. Semi-automatic case packer has 12-volt micro switches, air requirements of 12 C.F.M. at 60 PSI. A-B-C Packaging Machine Corp. **(R-396)**

AUTOMATIC BLISTER PACKAGER-SEALER. Illustrated 4-page brochure describes fully automatic machine handling blisters up to maximum depths, full line of sizes, cards from 2¾" x 3¾" to 8¾" x 11", producing finished blister packages at 3000 to 8000 or more per hour. Wirth-Rhodes Corp. **(R-397)**

AUTOMATIC FILLER. Data sheet illustrates and gives specifications of automatic high-speed frozen food filler, handling from 50 to 200 packages a minute, with a ¾ HP, 220/440 volt (variable speed) 3 phase, 60 cycle pump motor. Anderson Bros. Mfg. Co. **(R-398)**

AEROSOL PACKAGING. 8-page booklet contains facilities available for development, production and control of aerosol packaging, whether filling with liquefied propellant or compressed gas; metal, glass or plastic container or whether product is spray, foam or stream. G. Barr and Co. **(R-399)**

CARTONING MACHINES. 6-page brochure illustrates and describes (1) automatic lock, tuck and glue closing cartoning machines, and (2) lock and/or tuck machines leaving open end for filling. Complete specifications—dimensions, etc. Continental Can Co. **(R-400)**

CARTON SYSTEM. Illustrated 6-page brochure with sample describes "Diotite" carton system consisting of specially developed blank and automatic equipment for forming the blank into rigid-set-up shape and folding and heat sealing the cover of the loaded carton. Boxboard & Carton Div. Continental Can Co. **(R-401)**

CAPPING MACHINERY. 6-page data folder describes and gives specifications on nine models of capping machines which will meet most capping needs. Includes information on four additional units to meet special closure needs. Consolidated Packaging Machinery Corp. **(R-402)**

PACKAGING MACHINERY. 4-page illustrated bulletin gives specifications of tube filling and heat sealing machines; bag feeding and opening machines; powder compressing machine; fish nobbing machine; wrapping machine; loose powder filler and distributor elevator. Arenco Machine Co., Inc. **(R-403)**

NECKWRAP LABELER. 2-page bulletin describes and gives specifications of machine with speeds to 180 BPM developed to meet the special needs of spirits, wine, food and drug fields. Gisholt Machine Co. **(R-404)**

PACKAGING MACHINERY. 20-page booklet describes full line of cartoning and case packing machinery and its application to a wide variety of products including drugs, electronics, foods and books. R. A. Jones and Co., Inc. **(R-405)**

CONSTANT MOTION CARTONER. 8-page brochure describes the CMV constant motion vertical cartoner available in both automatic and semi-automatic models. Illustrates operational sequence and special features. R. A. Jones and Co., Inc. **(R-406)**

STRAPPING MACHINES. 4-page brochure illustrates and describes new automatic strapping machines called Avistrapper. Gives capacities and specifications together with illustration of strapping accessories. American Viscose Corp., Industrial Packaging Dept. **(R-407)**

CORD STRAPPING. 4-page brochure describes Avistrap cord strapping and metal seals and accessories. Specification charts, various applications and a sample of Avistrap are included. American Viscose Corp., Industrial Packaging Dept. **(R-408)**

MULTIWALL PACKAGING. 14-page booklet illustrates and describes principal types of multiwall bags and closures. Also describes line of machinery used to load multiwall bags. Bemis Bro. Bag Co. **(R-409)**

MOTION PACKAGER. 4-page folder explains in detail the operation of flexible packaging machines for forming, filling, and sealing pouches at rates of up to 500 per minute. Bartelt Engineering Co., Inc. **(R-410)**

VERTICAL PACKAGER. High speed, compact vertical tube flexible packager is explained in 4-page folder. Single tube speeds for the production of pillow-type pouches range from 40 to 100 per minute. Bartelt Engineering Co., Inc. **(R-411)**

POUCH PACKAGING. 4-page folder illustrates and describes "Flexopaker," a versatile pouch packaging machine for short runs of varied size articles and high-speed fixed product packaging. Battle Creek Packaging Machine, Inc. **(R-412)**

FILL, WRAP, CAP, MACHINES. 20-page booklet illustrates and describes full line of automatic filling, wrapping and capping machines including twin fillers and frozen food fillers. Elgin Manufacturing Co. **(R-413)**

BAG CLOSER. 4-page brochure describes new bag closing machine which double-folds and glues and makes other closures in one continuous motion. Gives data and specifications. George H. Fry Co. **(R-414)**

FILL INSPECTOR. 4-page brochure describes new fill inspection machine which reportedly inspects 1,000 containers per minute with high degree of accuracy. Rejects both underfilled and overfilled containers. Includes specifications. General Electric X-Ray Department. **(R-415)**

BAG MACHINE. Illustrated brochure describes "Matador" bag machines. Tucking blades, precision cams, draw rollers are all individually pictured and described. Heinrich Equipment Corp. **(R-416)**

LABEL APPLICATOR. Folder illustrates and describes uses and features of an automatic pressure-sensitive labeller which picks up a single label and applies it accurately. Gives construction and components together with operating specifications. Kleen-Stik Prods. Inc. **(R-417)**

PORTABLE LIQUID FILLERS. 24-page book illustrates and gives complete information on electronically controlled portable liquid fillers. Called Filamatic. It is a portable liquid filler that dispenses all liquids. Includes specifications. National Instrument Co., Inc. **(R-418)**

PLASTICS EXTRUDERS. 8-page bulletin illustrates and gives important information about new two and one-half inch and three and one-half inch plastics extruders. Special design and features plus specifications included. National Rubber Machinery Co. **(R-419)**

PLASTIC BLISTER SEALER. Two data sheets illustrate and describe two models of a simply operated plastic blister sealer, which make one seal every three seconds. Lists special features and specifications. Erdco Engineering Corp. **(R-420)**

GUMMED SEALING TAPE. Brochure describes and illustrates powered and manually operated tape dispensing machines for carton sealing and packing. Discusses use of regular and reinforced water activated sealing tape. Nashua Corp. **(R-421)**

WRAPPING MACHINES. Foldout brochure describes and illustrates a line of automatic wrapping machines which handle a wide variety of articles. Machines feature vacuum cardboard folder and feeder, and easy adjustment. Oliver Machinery Co. **(R-422)**

LIQUID FILLING. Data sheets describe rotary liquid filling machine which introduces a number of new features, including continuous all-around conveyor. Packer Machinery Corp. **(R-423)**

FILLING EQUIPMENT. 20-page catalog illustrates and describes in detail filters, filter sheets, bottle fillers, pumps and mixers. Includes diagrams, technical data and sources throughout the country. Ertel Engineering Corp. **(R-424)**

AUTOMATIC PACKAGING. 16-page booklet illustrates and gives important information about a full line of automatic packaging machinery with production speeds up to 300 per minute. The machines include feeder and bottom sealer, liners and package makers. Diagrams and specifications. Pneumatic Scale Corp., Ltd. **(R-425)**

HEAT SEALING. 22-page handbook discusses Bomb-Lube and its many uses, including heat sealing. Gives ease of operation on packaging machines when applied to the heat sealing guides and package guides. Price-Driscoll Corp. **(R-426)**

TAPE DISPENSER. Folder describes and illustrates a strapping tape dispenser that is lightweight and operates with one hand. Shows a variety of uses for speeding production, shipping and packaging. Permacel Tape Corp. **(R-427)**

AUTOMATIC MACHINERY. 8-page brochure illustrates and gives important information about a full line of packaging machinery including bag forming, filling and closing, carton forming, loading and closing, among others. Technical data and application examples included. Package Machinery Co. **(R-428)**

CONTINUOUS OPERATION MACHINES. 8-page brochure describes a full line of automatic continuous motion machines for capping, valve inserting, nozzle and dip tube assembly and case loading. Includes diagrams and wide range of product application. PMC, Inc. **(R-429)**

WEB GUIDE EQUIPMENT. 6-page manual illustrates and describes three principal models of web guide machinery, including hydraulic, vacuum principle and vacuum types. Tells why special components custom tailor this equipment to any operation. Stanford Engineering Co. **(R-430)**

BLOW MOLDERS. 4-page brochure illustrates and describes new high capacity dual-manifold blow molders. Shows wide range of product application. F. J. Stokes Corp. **(R-431)**

PACKAGING BLOW MOLDING MACHINE. Data sheet gives specifications, diagrams and illustration of a dual manifold continuous operation blow molding machine. Features ease of access to mold area, and versatility in product size. F. J. Stokes Corp. **(R-432)**

SPECIALTY MACHINERY. 4-page brochure describes and illustrates examples of special machinery that can be built for unique packaging operations. Lists successful users and certain case histories. Thiele Engineering Co. **(R-433)**

HEAT SEALING. 10-page booklet illustrates and gives technical data about thermal-impulse heat sealing machinery for thermoplastic materials. Gives descriptions of hand, foot pedal, and power operated pneumatic and electromagnetic models. Vertrod Corp. **(R-434)**

MULTI-CAPACITY PRESS. Folder describes a Multipress for imprinting of flat folded cartons, plus labels, bags, flat containers, sleeves, paper products. Gives specifications and a sample printing. B. Verner & Co., Inc. **(R-435)**

SEALING CRIMPERS. 4-page folder describes a complete line of heat sealing crimpers, both automatic and semi-automatic machines that provide the correct amount of heat and the right pressure for a secure seal. Illustrates sealing patterns available. Wrap-Ade Machine Co., Inc. **(R-436)**

PNEUMATIC HEAT SEALER. Data sheet illustrates and describes in detail a pneumatic heat sealer that provides automatic control of pressure, heat. Foot-operated and automatically timed. Wrap-Ade Machine Co., Inc. **(R-437)**

CASE BOTTLE PACKER. 4-page brochure describes and gives important information about a bottom-loading case packer for bottled goods. Machine lifts bottles into case, reduces damage, increases speed of operation. Climax Products Div., Lodge & Shipley Co. **(R-438)**

UNCASERS. 4-page folder describes a continuous operation uncaser that handles both bottles and cans. Uncases up to 50 cases per minute. Includes diagrams and data. Climax Products Div., Lodge & Shipley Co. **(R-439)**

SINGLE FILER. Bulletin illustrates and describes a high speed single filer for empty or filled jars, cans and bottles, in a wide range of glass, metal and plastic containers. Tells how the machine unscrambles and feeds up to 600 containers per minute. Climax Products Div., Lodge & Shipley Co. **(R-440)**

ROTAMATIC PACKER. Data file describes in detail an open-mouthed packer that is fully automatic and designed for accurately weighing and packing free flowing materials. Contains diagrams, operating and installation specifications. Raymond Bag Corp. **(R-441)**

PLASTIC PACKAGING EQUIPMENT. Reference file gives important information about plastic sealers, wrapping units and heat shrink tunnel, in addition to accessories. Specifications. Clamco Div., Cleveland-Detroit Corp. **(R-442)**

BLISTER SEALING EQUIPMENT. Data sheets illustrate and describe manual or fully automatic blister sealing machine with turntable and conveyor. Seals in less than one second to cardboard plastic or coated materials. Thermo-Dielectric Machine Co., Inc. **(R-444)**

AUTOMATIC PACKAGING. 8-page brochure describes a line of versatile automatic packaging machines, and systems. Illustrates seal tube and double tube machines and accessory equipment. Data and specifications included. Lynch Corp. **(R-445)**

BAR WRAPPER. 4-page brochure describes a variable speed bar wrapper that features a new vibratory feeder. Increases capacity to 150 bars per minute. Diagrams and special features illustrated. Lynch Corp. **(R-446)**

PLASTIC FORMING MACHINE. 4-page brochure describes an automatic packaging machine which forms any kind of thermoformable film or sheet into various types of small packaging containers. It fills, seals and trims in synchronized operations. Hydro-Chemie. Conapac Corp. **(R-447)**

BAG PACKER. 6-page brochure illustrates and gives important data on a line of bag packing machines. One model shakes, settles, weighs, fills in a single operation and features push-button control. E. D. Coddington Mfg. Co. **(R-448)**

THERMOPLASTIC EQUIPMENT. 16-page book describes complete thermoplastic systems designed and made to order. Illustrates extruders, casting equipment and blow-molding equipment among others. Modern Plastic Machinery Corp. **(R-449)**

LIQUID FILLING. Bulletin describes automatic liquid filling machines and includes illustrations of a complete line

of basic vacuum filler models designed and engineered for specific requirements. U. S. Bottlers Machinery Co. **(R-450)**

GENERATORS. 4-page folder on a line of packaged nitrogen atmosphere generators. Included are typical installation features and a comprehensive flow chart. For use in food packaging, refining, metallurgy and storage. Gas Atmospheres, Inc. **(R-451)**

GLUE SYSTEM. 6-page brochure describes various systems for precision gluing automatically at any operating speed. Illustrates various glue guns for particular operations. John P. Fox Co., Inc. **(R-452)**

CARTON SEALER. 10-page booklet describes a full line of carton sealers with accessories. Pilfer-proofs cartons by completely sealing both ends with a resin glue. Alford Package Machines, Inc. **(R-453)**

TAPING AND DISPENSING EQUIPMENT. 16-page booklet describes and illustrates a full line of plastic and paper tapes and dispensers together with sealers and edgers and related equipment, contains specifications and sources throughout the U. S. Minnesota Mining and Manufacturing Co. **(R-454)**

WEIGHT SENSING. 8-page illustrated book shows how measurement of weight or force is applied for automatic control. Can classify, record, imprint, count, etc. Complete description, specifications, advantages, typical applications. The Exact Weight Scale Co. **(R-455)**

MATERIALS HANDLING SYSTEMS. 44-page booklet describes and illustrates a line of materials handling systems that feature coordinated materials handling. Operation includes movement, accumulation, transfer, control. Data and specifications given. The Rapids-Standard Co., Inc. **(R-456)**

INDEXING AND TRANSFER. 36-page book illustrates and describes a full line of accelerations for high-speed precision indexing and transfer. Diagrams show how equipment can complete up to 2000 indexes a minute. Ferguson Machine Co. **(R-457)**

WATER CHILLER. Brochure describes air-cooled industrial water chiller that requires no water for refrigeration cycle. Features closed system for 100% recovery of water for processing. Saran Inc. **(R-458)**

VERSATILE AUTOMATION TOOL. 8-page booklet describes a number of basic devices capable of directly replacing costly hand labor. Performs virtually any repetitive task, associated with hand and arm motion. Describes typical applications and accessories. U. S. I. Robodyne Division of U. S. Industries Inc. **(R-459)**

SCALE SYSTEM. Data sheet describes two models of scale systems adaptable to most products. Shown is a four-scale horizontal unit with conveyor and a two-scale vertical unit. Reportedly reduces overweight margins up to 75%. Mercury Heat Sealing Equipment Co. **(R-460)**

CONVEYOR CHAIN. 4-page illustrated folder describes projection welded conveyor chain giving up to 35% more rail load-bearing area than other top plate chains. Dimensions and prices included. Diamond Chain Co. **(R-461)**

ANTISTATIC BAR. 6-page brochure illustrates and describes shockless static bars and antistatic cleaning devices. Equipment neutralizes materials that have accumulated static under a variety of conditions. Illustrates range of applications. The Simco Co. **(R-462)**

LETTERING PIN. 12-page brochure describes a felt-point drawing and lettering pen and shows its many uses in industry. Marsh Stencil Machine Co. **(R-463)**

STRAP BINDER. Data sheet describes and gives recommended use of a light weight strap binder. Illustrates simple operation for fast take-up. A. J. Gerrard and Co. **(R-464)**

SPEED CONTROLS SYSTEMS. 8-page brochure illustrates and describes a full line of controlled speed systems that make any motor a variable speed motor and coordinates many motors, among other features. Gives important data and variety of applications. U. S. Electrical Motors, Inc. **(R-465)**

SPIRAL TUBE WINDERS. Bulletin gives specifications and illustrates automatic spiral tube winders (1) featuring hydraulically-operated integral cut-off model, and (2) mechanically-operated integral cut-off model for high-speed production of roll cores, can bodies, protective sleeves, etc. Dietz Machine Works. **(R-466)**

GANG SLITTERS. 4-page data bulletin illustrates and gives specifications of (1) heavy duty gang slitters with 3 HP motor taking maximum sheet size of 37¼ x 36 in. at a maximum speed of 70 spm, and (2) single gang slitters with 1 HP motor and maximum sheet size of 36 in. with an approx. maximum speed of 30 spm. Baldwin-Lima-Hamilton Corp. **(467)**

CONVEYOR CHAINS. Descriptive 4-page brochure shows conveyor chains designed for bakery application, consisting of two parallel strands of standard A.S.A. chain #40, joined together by cross rods on every chain pitch. Standardized dimensions and material specifications included. Acme Chain Corp. **(R-468)**

TACKERS, STAPLERS, BRAD GUNS. Illustrated 26-page catalog describes a line of gun, hammer, strike and air-powered tackers, brad guns, air pliers, foot powered staplers and tackers, bench staplers and accessories. Fastener Corp. **(R-469)**

CARTONS SET UP. 12-page illustrated booklet describes equipment that sets up 6 to 16 oz. carriers—up to 60 carriers per minute automatically. Covers how to start setting up, operating cycle, maintenance. Complete descriptions, detailed drawings, other data. Diamond National Corp., Gardner Div. **(R-470)**

HYDRAULIC OIL COOLER. Specification sheet discusses hydraulic oil cooler —new radiator type that pumps oil from tank, air cools it, and returns it to injection machine. For most presses from 2 to 16 oz. capacity. Features, applications, specifications. Injection Molders Supply Co. **(R-471)**

PAPER SHREDDERS. 4-page booklet describes line of shredders for daily disposal of heavy cartons, boxboard and newspapers. Seven models described. Industrial Shredder & Cutter Co. **(R-472)**

A-C MOTORS. 16-page illustrated booklet describes complete line of A-C motors from 1 to 2,000 HP. Features of each motor are clearly outlined and explained for easy selection of right motor for every application. Reliance Electric & Engineering Co. **(R-473)**

INSPECTION SCALES. Two illustrated specification sheets describe inspection scales with dual calibrations that speed up inspection of predetermined weight commodities. Fractional ounce side; decimal pound side. Complete description, specifications, dimensions. The Exact Weight Scale Co. **(R-474)**

IN-LINE CHECK WEIGHING. 8-page brochure illustrates automatic in-line check weighers and accessories and describes how they automatically provide 100% in-line, in-motion inspection of a broad range of package sizes and weights. Toledo Scale, Division of Toledo Scale Corp. **(R-475)**

CASE PACKERS. 32-page spiral-bound booklet describes a line of case packers for bulk can handling. Gives diagrams, floor plans of various packers with recommendations for type of machine best suited to particular operation. R. A. Jones and Co., Inc., **(R-476)**

POWERED CONVEYORS. An 84-page catalog and engineering handbook describes many types of conveyors available and the custom services they perform. Includes dimensional data and design features. Lamson Corp. **(R-477)**

CARTONING EQUIPMENT. 18-page booklet entitled "Cartoning and Case Packing Ideas" illustrates cartoning systems, presents some of the many different types of products that are being cartoned on the semi and fully automatic machinery. Booklet is indexed and gives data and specifications. R. A. Jones Co., Inc. **(R-478)**

CUSTOM DESIGNED MACHINERY. Illustrated bulletin describes leading manufacturer of custom designed machinery. Special types of machinery include peach cartoning machines; plastics packaging machines; filling, capping and heat sealing equipment. Lee Associates. **(R-479)**

CHECKWEIGHER. Illustrated data sheet describes a continuous motion unit that provides fully automatic weight control of filled containers. Easily adjusted to fit all production lines. Specifications, optional equipment, etc. FMC Corp., Packaging Machinery Div. **(R-480)**

POUCH PACKAGING. Illustrated sheet describes a pouch-forming, filling and sealing machine. Speeds up to 150 packages per minute. Sizes from 2" x 3" to 8" x 14½". Specifications, dimensions, etc. FMC Corp., Packaging Machinery Div. **(R-481)**

PACKAGE CASER. 8-page brochure describes a package caser that is available in 13 different models. Illustrates the basic standard models and its components. Specifications, dimensions. FMC Corp., Packaging Machinery Div. **(R-482)**

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26	56	86	116	146	176	206	236	266	296	326	356	386	416	446	476	506
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28	58	88	118	148	178	208	238	268	298	328	358	388	418	448	478	508
29	59	89	119	149	179	209	239	269	299	329	359	389	419	449	479	509
30	60	90	120	150	180	210	240	270	300	330	360	390	420	450	480	510

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26	56	86	116	146	176	206	236	266	296	326	356	386	416	446	476	506
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The data herein are compiled from information furnished by the Companies referred to and the publisher, its officers, employees and agents do not represent and/or guarantee the accuracy of said data and listings and do not accept any responsibility in connection therewith. Said data, etc., are included as a service only.

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Materials and Supplies Section

ADHESIVES*

Editorial information, Div. I Sec. 5

•Adcote Chemicals, Inc., Elk Grove, Ill.
Adhesive Products Corp., New York
Adhesive Products, Inc., Albany, Calif.
•Allied Chemical Corp., Plastics Div., New York
American Adhesive Mfg. Co., Brooklyn, N. Y.
American Cyanamid Co., Plastics & Resins Div., Wallingford, Conn.
American Products Mfg. Co., New Orleans, La.
Arabol Mfg. Co., New York
Armour Alliance Industries, Alliance, Ohio
•Armstrong Cork Co., Lancaster, Pa.
Atwood Adhesives, Inc., Seattle, Wash.
Bee Chemical Co., Lansing, Ill.
Bond Adhesives Co., Jersey City, N. J.
Borden Chemical Co., New York
Cadillac Plastic & Chemical Co., Detroit
California Ink Co., San Francisco
Catalin Corp. of America, New York
Clark Stek-O Corp., Rochester, N. Y.
Commercial Paste Co., Columbus, Ohio
Connecticut Hard Rubber Co., New Haven, Conn.
Cooper, Peter, Corporations, Gowanda, N. Y.
Corn Products Sales Co., New York
Darling & Co., Chicago
Dennis Chemical Co., St. Louis, Mo.
•Dow Chemical Co., Midland, Mich.
Dow Corning Corp., Midland, Mich.
Dreyfus, L. A., Co., So. Plainfield, N. J.
Dunn, Thomas W., Co., Ridgefield, N. J.
•du Pont de Nemours, E. I., & Co., Wilmington, Del.
•Eastman Chemical Products, Inc., Kingsport, Tenn.
Findley, F. G., Co., Milwaukee
Flexcraft Industries, Newark, N. J.
•Fuller, H. B., Co., St. Paul, Minn.
General Adhesives & Chemical Co., Nashville, Tenn.
General Latex & Chemical Corp., Cambridge, Mass.
Glue-Fast Equipment Co., New York
Goodrich, B. F., Industrial Products Co., Akron, Ohio
Goodyear Tire & Rubber Co., Chemical Div., Akron, Ohio
Gordon-Lacey Chemical Products Co., Maspeth, N. Y.
Hewitt, C. B., & Bros., Inc., New York
Hughes Glue Co., Detroit
Imperial Adhesives, Cincinnati
Imperial Chemical Industries Ltd., London, England
Interchemical Corp., Finishes Div., Newark, N. J.
Johns-Manville, New York
Madison Glue Corp., New York
Manhattan Adhesives Corp., Brooklyn, N. Y.
Marblette Corp., Long Island City, N. Y.
Minnesota Mining & Mfg. Co., St. Paul, Minn.
Monsanto Chemical Co., St. Louis, Mo.
Montecatini, Milano, Italy
Morgan Adhesives Co., Stow, Ohio
•Morningstar-Paisley, Inc., New York
National Casein Co., Chicago
National Starch & Chemical Corp., New York
National Starch & Chemical Co. (Canada), Toronto, Ont.
Nicol, Malcolm, & Co., Hawthorne, N. J.
Noble, M. J., Co., San Francisco
Permacel, New Brunswick, N. J.
Philadelphia Quartz Co., Philadelphia
Pierce & Stevens Chemical Corp., Buffalo, N. Y.
Polymer Industries, Inc., Springdale, Conn.
•Pyroxylin Products, Inc., Chicago
Research Sales, Inc., Suffern, N. Y.
Resisto Chemical, Inc., Wilmington, Del.
Reynolds Chemical Products Co., Whitmore Lake, Mich.
Roma Adhesives, Inc., E. Newark, N. J.
Rubber & Asbestos Corp., Bloomfield, N. J.
Schwartz Chemical Co., Long Island City, N. Y.
Shell Chemical Co., Plastics & Resins Div., New York
Socony Mobil Oil Co., New York
Southern Adhesives Corp., Richmond, Va.
Standard Paste & Glue Co., Chicago
Stein, Hall & Co., New York
Swift & Co., Adhesive Products Dept., Chicago
Terrell Corp., Wilmington, Mass.
Testworth Laboratories, Inc., Addison, Ill.
Tragacine Adhesives, Leeds, England
•Union Paste Co., Boston, Mass.
United Paste & Glue Corp., New York
•United Shoe Machinery Corp., Boston
United States Rubber Co., New York
Virginia Chemical Corp., Lynchburg, Va.
Williamson Adhesives, Inc., Skokie, Ill.

*Adhesives are usually formulated for specialized applications. This is particularly true of the newer resinous adhesives. The user should consult his supplier and give full information as to requirements and conditions of use.

AEROSOL PROPELLANTS

(See Propellants, Aerosol)

AEROSOL VALVES

(See Valves, Aerosol)

APPLICATOR CLOSURES

(See Closures, Applicator & Dispensing)

BANDS, PRINTED

(See Labels & Cut Wraps)

BARRIER MATERIALS

(See also Liners)

Editorial information, Div. V Sec. 17

•Acme Backing Corp., Stamford, Conn.
Albemarle Paper Mfg. Co., Richmond, Va.
Arkell Safety Bag Co., New York
Artmor Plastics Corp., Cumberland, Md.
Arvey Corp., Chicago
Canada Glazed Papers Ltd., Scarborough, Ont.
Canton Containers, Inc., Canton, Ohio
•Cellu-Craft Products Corp., New Hyde Park, N. Y.
•Continental Can Co., Flexible Packaging Div., Mt. Vernon, Ohio
Crocker, Burbank Papers, Inc., Fitchburg, Mass.
Crown Zellerbach Corp., Western-Waxide Div., San Leandro, Calif.
•Dobeckmun Co., Div. Dow Chemical Co., Cleveland
•Fibreboard Paper Products Corp., San Francisco
•Flex-O-Glass, Inc., Chicago
Glenfab Bag & Liner Co., Glens Falls, N. Y.
•Hamersley Mfg. Co., Garfield, N. J.
KVP Sutherland Paper Co., Kalamazoo, Mich.
•Kordite Co., Div. National Distillers & Chemical Co., Macedon, N. Y.
Leewood Corp., Lowell, Mass.
M & Q Plastic Products, Freehold, N. J.
Marvellum Co., Holyoke, Mass.
Mason Transparent Package Co., Div. Mason Envelope Co., New York
Melrose Packaging Corp., Flushing, N. Y.
Mid-West Wax Paper Co., Fort Madison, Iowa
Modern Packaging, Inc., Mt. Holly, N. J.
Pennsylvania Industrial Chemical Co., Clairton, Pa.
Plastic Film Co., Plainfield, Conn.
Protective Coatings Corp., Clifton, N. J.
Quality Packaging Supply Corp., Englewood, N. J.
•Queen Transparent Specialties Co., Chicago
R. & R. Paper Converting Co., Los Angeles
•Riegel Paper Corp., New York
Ruberoid Co., Safepack Mills Div., New York
Schwartz Chemical Co., Long Island City, N. Y.
Sherman Paper Products Co., Div. St. Regis Paper Co., Newton Upper Falls, Mass.
Shore Line Industries, Inc., Clinton, Conn.
•Smith, H. P., Paper Co., Chicago
Standard Insulation Co., E. Rutherford, N. J.
•Standard Packaging Corp., New York
•Thilmany Pulp & Paper Co., Kaukauna, Wis.
VanPak Products, Inc., Tomah, Wis.
Western Foil Co. of Seattle, Seattle, Wash.
Western Foil Converters, Inc., Berkeley, Calif.
•Westfield River Paper Co., Russell, Mass.
Wyndmoor Mfg. Corp., Newark, N. J.

BOXBOARD

A. *Clay-Coated*
B. *Folding & Set-Up*
C. *Laminated*
D. *Metallic-Coated*
E. *Moistureproof & Greaseproof*
F. *Thermoplastic-Coated*

Editorial information, Div. I Sec. 3, Div. II Sec. 6

Abt Lithographers, Inc., Branford, Conn. (F)
Albemarle Paper Mfg. Co., Richmond, Va. (A, B, C, E)
American Sisalkraft Co., Attleboro, Mass. (C, E)

Andre Paper Box Co., San Leandro, Calif. (C)
Berles Carton Co., Paterson, N. J. (A, B, C, E)
Butterfield-Barry Co., Teterboro, N. J. (A, B, C, D, E)
Cahill, J. D., Co., Hampton, N. H. (C, F)
Champion Papers, Inc., Hamilton, Ohio (A, B, E, F)
•Cincinnati Box & Partition Co., Cincinnati (E, F)
•Columbia Box Board Mills, Inc., Chatham, N. Y. (B, C)
Consolidated Paper Co., Monroe, Mich. (A, B, C, E)
Constantine Paperboard Div., The Davey Co., Constantine, Mich. (B, C)
Container Corp. of America, Chicago (A, B, C, D, E)
•Continental Can Co., Folding Carton & Drum Div., New York (A, B, C, D, E, F)
•Continental Can Co., Flexible Packaging Div., Mt. Vernon, Ohio (C)
Cornell Paperboard Products Co., Div. St. Regis Paper Co., Milwaukee (A, B, C, E)
•Crossett Paper Mills, Crossett, Ark. (B)
Crown Paper Board Co., Philadelphia (B, C)
Crown Zellerbach Corp., Western-Waxide Div., San Leandro, Calif. (A, B, C, D, E, F)
Dejonge, Louis, & Co., New York (D)
•Downingtown Paper Co., Packaging Div., Downingtown, Pa. (A, B, C)
East Texas Pulp & Paper Co., Silsbee, Texas (A, B, C, E)
Facile Corp., Sub. Sun Chemical Corp., Paterson, N. J. (C)
•Fibreboard Paper Products Corp., San Francisco (A, B, C, D, E, F)
Flintkote Co., Los Angeles (B)
•Foils Packaging Corp., Cincinnati (C, D, E, F)
Formed Container Corp., Sub. Phillips Petroleum Co., Orangeburg, N. Y. (F)
Gardiner Paper Mills, Inc., Gardiner, Maine (B, C, E)
•Gardner Div., Diamond National Corp., Middletown, Ohio (A, B, C, D, E)
Gilman Paper Co., New York (B)
Gummed Products Co., Div. St. Regis Paper Co., Troy, Ohio (B, C, E)
•International Paper Co., New York (A, B, C, E)
Interstate Folding Box Co., Middletown, Ohio (A, B, C, E)
KVP Sutherland Paper Co., Kalamazoo, Mich. (A, B, C, D, E, F)
Lamex, Inc., Norcross, Ga. (C, E)
Laminated Paper Products, Santa Clara, Calif. (C, E)
Leominster Paper Box Co., Leominster, Mass. (C)
Los Angeles Paper Box & Board Mills, Los Angeles (B)
Lowe Paper Co., Ridgefield, N. J. (A, D, E, F)
M & Q Plastic Products, Freehold, N. J. (C, F)
Mac Sim Bar Paper Products Co., Otsego, Mich. (A, B)
•Marathon, Div. American Can Co., Menasha, Wis. (B, C, E, F)
Marvellum Co., Holyoke, Mass. (F)
Mead Board Sales, Inc., Cincinnati (A, B, C, E, F)
Metal Edge Industries, Barrington, N. J. (B, C, D, E)
Michigan Carton Co., Battle Creek, Mich. (A, B, C, D, E)
Mitcham Cardboards Ltd., Croydon, England (B, C, E)
Murnane Paper Co., Northlake, Ill. (E, F)
Narragansett Coated Paper Corp., Pawtucket, R. I. (D)
Nelson, B. F., Mfg. Co., Minneapolis (A, B, C)
•Olin, Packaging Div., Forest Products Operations, W. Monroe, La. (A, B)
•Packaging Corp. of America, Evanston, Ill. (A, B, C, E)
•Paper Package Co., Div. Creative Packaging, Inc., Indianapolis (C)
Paperboard Laminating Corp., Norwalk, Conn. (C)
Potlatch Forests, Inc., Lewiston, Idaho (A, B, C, E, F)
Puget Sound Pulp & Timber Co., Bellingham, Wash. (B)
Raisin, John T., Corp., San Francisco (C)
Revere Copper & Brass, New York (C)
•Riegel Paper Corp., New York (A, B, E, F)
Robertson Paper Box Co., Montville, Conn. (B, E)
Rupaco Paper Corp., Brooklyn, N. Y. (A, B, C, D)
St. Regis Paper Co., New York (B, C, D, E, F)
Salwen Paper Co., Brooklyn, N. Y. (A, B, C, D, E, F)
Schmidt & Ault Paper Co., Div. St. Regis Paper Co., York, Pa. (B)
Shopsin Paper Co., New York (A, B, C, D, E)
Smith, Howard, Paper Mills Ltd., Montreal, Que. (A, B)
Southern Special Products, Richmond, Va. (C, D, E)
•Standard Packaging Corp., New York (A, B, C, D, E, F)
Stone Container Corp., Chicago (B, C, E)
Strange, John, Paper Co., Menasha, Wis. (B)
Tennessee Paper Mills, Inc., Chattanooga, Tenn. (A, B, C)
Unger Laminating Co., Brooklyn, N. Y. (C, D)
Union Bag-Camp Paper Corp., New York (A, B, C, E, F)
Upson Co., Lockport, N. Y. (B, C)
Vis-A-Pak Mfg. Corp., New York (F)
Waldorf Paper Products Co., St. Paul, Minn. (A, B, C, D, E)
•Warren, S. D., Co., Boston (B)
•West Virginia Pulp & Paper Co., New York (A, B)
Western Foil Co. of Seattle, Seattle, Wash. (C)
Western Foil Converters, Berkeley, Calif. (C, D)
Weyerhaeuser Co., Boxboard & Folding Carton Div., Chicago (A, B, D, E, F)
Weyerhaeuser Co., Wood Products Div., Tacoma, Wash. (C)
Wyomissing Paper Products, Reading, Pa. (D)

BRUSHES, MARKING & STENCILING

Editorial information, Div. III Sec. 13

Applicator Co., Brooklyn, N. Y.
Diagraph-Bradley Industries, Inc., Herrin, Ill.
Floquil Products, Inc., Cobleskill, N. Y.
•Henlopen Mfg. Co., Brooklyn, N. Y.
Ideal Stencil Machine Co., Belleville, Ill.
Marsh Stencil Machine Co., Belleville, Ill.
Pannier Corp., Pittsburgh
Superior Marking Equipment Co., Chicago

CAN SEALING COMPOUNDS

Editorial information, Div. II Sec. 9

Adhesive Products Corp., New York
Dewey & Almy Chemical Div., W. R. Grace & Co., Cambridge, Mass.
•Morningstar-Paisley, Inc., New York
Pyroxylin Products, Inc., Chicago
Research Sales, Inc., Suffern, N. Y.
Terrell Corp., Wilmington, Mass.
Virginia Chemical Corp., Lynchburg, Va.

CARDS, THERMOPLASTIC-COATED

Editorial information, Div. II Sec. 8

•American Tag Co., Belleville, N. J.
Averil, Inc., Miami, Fla.
Bock, Frank, New York
Box Shop, Inc., New Haven, Conn.
Contour Packaging Co., Philadelphia
•Creative Packaging, Inc., Indianapolis
Crystal Preforming & Packaging, Inc., Warsaw, Ind.
Diamond Printing & Label Corp., Philadelphia
•Frank, Walter, Organization, Hillside, Ill.
Gabe-Bert Crafts, Inc., Yonkers, N. Y.
•Jackmeyer Corp., New York
•Lassiter, Div. Riegel Paper Corp., New York
Leedpak, Inc., New York
Mankato Paper Box Co., Mankato, Minn.
Murnane Paper Co., Northlake, Ill.
Nevins Co., Clifton, N. J.
•Paper Package Co., Div. Creative Packaging, Inc., Indianapolis
Rothchild Printing Co., New York
•Standard Packaging Corp., General Felt Products Div., Brooklyn, N. Y.
Universal Folding Box Co., Hoboken, N. J.
Valley-National Corp., Milldale, Conn.
Vis-A-Pak Mfg. Corp., New York

CELLOPHANE

(See Films, Cellophane)

CLOSURE LINERS

Editorial information, Div. II Sec. 10

Applicator Co., Brooklyn, N. Y.
•Armstrong Cork Co., Lancaster, Pa.
•Chemical Products Corp., E. Providence, R. I.
•Contour Extrusion Co., Mamaroneck, N. Y.
•Dyna-Foam Div., Sun Chemical Corp., Ellenville, N. Y.
Engelhard Industries, Inc., Newark, N. J.
Gardiner Paper Mills, Inc., Gardiner, Maine
Guild Molders, Inc., Elmsford, N. Y.
Gummed Products Co., Div. St. Regis Paper Co., Troy, Ohio
H & R Plastics Industries, Inc., Nazareth, Pa.
•Henlopen Mfg. Co., Brooklyn, N. Y.
Leewood Corp., Lowell, Mass.
Mead Board Sales, Inc., Cincinnati
Metal Fabrications, Inc., Waterbury, Conn.
•Riegel Paper Corp., New York
Schmidt & Ault Paper Co., Div. St. Regis Paper Co., York, Pa.
Standard Insulation Co., E. Rutherford, N. J.
•Standard Packaging Corp., General Felt Products Div., Brooklyn, N. Y.
Walsello Products, Inc., Paterson, N. J.

CLOSURE SEALING COMPOUNDS

Editorial information, Div. II Sec. 10

•Adcote Chemicals, Inc., Elk Grove, Ill.
Adhesive Products Corp., New York
Borden Chemical Co., New York
Dewey & Almy Chemical Div., W. R. Grace & Co., Cambridge, Mass.
•Morningstar-Paisley, Inc., New York
Philadelphia Quartz Co., Philadelphia
Pyroxylin Products, Inc., Chicago
Sonneborn Chemical & Refining Co., New York
Virginia Chemical Corp., Lynchburg, Va.
Watson-Standard Co., Pittsburgh

CLOSURES, APPLICATOR & DISPENSING

A. Atomizer & Spray
B. Brush
C. Dauber
D. Dropper
E. Glass
F. Pump-Type
G. Rod

Editorial information, Div. II Sec. 10

AP Applicator Co., Pleasantville, N. Y. (B, C, D, G)
•Anchor Hocking Glass Corp., Lancaster, Ohio (D)
Applicator Co., Brooklyn, N. Y. (A, B, C, D, E, F, G)
•Armstrong Cork Co., Lancaster, Pa. (E)
Bakan Plastics, Kansas City, Mo. (A, F)
•Colonial Applicator Co., Vineland, N. J. (D, E)
Container Corp. of America, Chicago (A, B, C, D)
•Dab-O-Matic Corp., Yonkers, N. Y. (B, C)
•Dosamatic Dropper Corp., Freeport, N. Y. (D, F)
•Dougherty Brothers, Buena, N. J. (D, E, G)
Dripcut Starline Corp., Santa Barbara, Calif. (E)
•Erno Products Co., Philadelphia (A, B, C, D, E, F, G)
Evans Crowder Co., So. Lyon, Mich. (A, F)
Flyndustries, Inc., New York (A, B, C, F)
•Frank, Walter, Organization, Hillside, Ill. (A, B, C, E, F)
Guild Molders, Inc., Elmsford, N. Y. (C, D, G)
•Henlopen Mfg. Co., Brooklyn N. Y. (B, C, D, E, G)
Hydrawlik Co., Roselle, N. J. (A, D)
•Imco Container Co., Kansas City, Mo. (A, D)
Metal Fabrications, Inc., Waterbury, Conn. (A)
Metalite, Inc., Meriden, Conn. (A)
•Owens-Illinois Glass Co., Toledo, Ohio (A, B, C, D, E, G)
•Pennsylvania Glass Products Co., Pittsburgh (B, D, E, G)
PharmaPlastics, Inc., Baltimore, Md. (D)
Plastic Assembled Products, Inc., Baltimore, Md. (A, B, C, D, E, G)
•Plax Corp., Hartford, Conn. (A, C. D)
Service Engineers, Inc., Fort Worth, Texas (D)
Special Glass Products Co., New York (D, E)
Thatcher Glass Mfg. Co., Plastic Container Div., New York (A, B, C, D)
•Wirz, A. H., Inc., Chester, Pa. (A, E, F, G)

CLOSURES, BAG

A. Clamps & Rings
B. Flexible Ties
C. Header Labels

Editorial information, Div. II Sec. 7, Div. IV Sec. 16

Abt Lithographers, Inc., Branford, Conn. (C)
Ackermann, G. A., Printing Co., Cicero, Ill. (C)
Acme Tag Co., Minneapolis (C)
Adhesive Tape Corp., Brooklyn, N. Y. (B)
Arkell & Smiths, Hudson Falls, N. Y. (B)
•Auer, J. F., Inc., Mamaroneck, N. Y. (B)
Better Containers Mfg. Co., Chicago (B)
•Clamco Div., Cleveland-Detroit Corp., Cleveland (A, B)
•Dennison Mfg. Co., Framingham, Mass. (C)
Diamond Printing & Label Corp., Philadelphia (C)
Dickinson, John, & Co., Hemel Hempstead, Herts., England (C)
•Dobeckmun Co., Div. Dow Chemical Co., Cleveland (B)
Foilcraft Printing Corp., New York (C)
Gabe-Bert Crafts, Inc., Yonkers, N. Y. (C)
General Films, Inc., Covington, Ohio (A, B)
Germain's, Inc., Los Angeles (B)
Goodbar Mfg. Co., Div. Hargood Ribbon Co., New York (A, B)
Grace, W. R., & Co., Cryovac Div., Cambridge, Mass. (A)
Heat Sealing Equipment Mfg. Co., Cleveland (A, B)
Kehr Products Co., Willow Grove, Pa. (B)
Kendall Mfg. Co., Milwaukee (B, C)
Keystone Packaging Service, Inc., Philipsburg, N. J. (A, B, C)
Kimball, A., Co., Brooklyn, N. Y. (B, C)
•Kobi Polyethylene Bag Mfg. Co., Brooklyn, N. Y. (B)
Lion Packaging Products Co., Hicksville, N. Y. (B)
Maine Potato Bag Co., Caribou, Maine (B)
•Mehl Mfg. Co., Cincinnati (B)
•Northland Bag Corp., Yonkers, N. Y. (C)
Pexco Bag Mfg. Co., Toledo, Ohio (A, B)
•Plastic Packaging Co., Chicago (B, C)
•Plas-Ties Co., Santa Ana, Calif. (B)
Portland Label Co., Portland, Ore. (C)
•Protective Lining Corp., Brooklyn, N. Y. (B)
•Queen Transparent Specialties Co., Chicago (B)
Rie, John L., Inc., Yonkers, N. Y. (A)
Safelon Corp., Yonkers, N. Y. (B)
St. Regis Paper Co., New York (A, B, C)
Schmidt Lithograph Co., San Francisco (C)
Sealcraft Products Corp., Milwaukee (B)
Shore Line Industries, Inc., Clinton, Conn. (B)
Soabar Co., Philadelphia (C)
Somerville Ltd., London, Ont. (B)
Speedmaster Packaging Corp., New York (B)
Springman & Wood Co., Passaic, N. J. (A)
•Stoffel Seals Corp., Tuckahoe, N. Y. (A, B)
Swartz Mfg. Co., Dorchester, Mass. (B)
Tipper Tie Products of New Jersey, Inc., Union, N. J. (A)
•Tompkins' Label Service, Philadelphia (C)
Twitchell, E. W., Inc., Packaging Div., Philadelphia (B)
Vac-Tie Fasteners, Inc., Elizabeth, N. J. (A)
Visual Bag, Inc., New York (B)
Werthan Bag Corp., Nashville, Tenn. (B)
•West Virginia Pulp & Paper Co., New York (B)

CLOSURES, CELLULOSE SEALS
(See Closures, Secondary Caps & Bands)

CLOSURES, CROWN

Editorial information, Div. II Sec. 10

•Armstrong Cork Co., Lancaster, Pa.
Braun, W., Co., Chicago
Consolidated Cork Corp., Brooklyn, N. Y.
•Continental Can Co., Bond Crown & Cork Div., Chicago
•Crown Cork & Seal Co., Philadelphia
Hutchinson, W. H., & Son, Inc., Chicago
Metal Fabrications, Inc., Waterbury, Conn.

CLOSURES, DRUM, METAL

Editorial information, Div. V Sec. 17

•Continental Can Co., Metal Div., New York
Drum Parts, Inc., Cleveland
Eastern Steel Barrel Corp., Bound Brook, N. J.
Rieke Metal Products Corp., Auburn, Ind.

CLOSURES, GLASS

Editorial information, Div. II Sec. 10

Braun, W., Co., Chicago
•Crown Cork & Seal Co., Philadelphia
•Erno Products Co., Philadelphia
•Henlopen Mfg. Co., Brooklyn, N. Y.
•Owens-Illinois Glass Co., Toledo, Ohio
•Pennsylvania Glass Products Co., Pittsburgh
Wheaton Glass Co., Millville, N. J.

CLOSURES, METAL

Editorial information, Div. II Sec. 10

•American Can Co., Canco Div., New York
American Star Cork Co., Brooklyn, N. Y.
•Anchor Hocking Glass Corp., Lancaster, Ohio
Applicator Co., Brooklyn, N. Y.
•Armstrong Cork Co., Lancaster, Pa.
•Ball Brothers Co., Muncie, Ind.
Bernardin Bottle Cap Co., Evansville, Ind.
Clarke Can Co., Philadelphia
Clover Industries, Inc., Tonawanda, N. Y.
•Continental Can Co., Hazel-Atlas Glass Div., Wheeling, W. Va.
•Crown Cork & Seal Co., Philadelphia
Dixie Cup Div., American Can Co., Easton, Pa.
Drum Parts, Inc., Cleveland
•Erno Products Co., Philadelphia
•Frank, Walter, Organization, Hillside, Ill.
Heat Sealing Equipment Mfg. Co., Cleveland
•Henlopen Mfg. Co., Brooklyn, N. Y.
Keystone Cap Co., Columbia, Pa.
Landau Metal Products Corp., Long Island City, N. Y.
•Lusteroid Container Co., Maplewood, Mo.
•Metal Closures Ltd., West Bromwich, Staffordshire, England
Metal Fabrications, Inc., Waterbury, Conn.
Metalite, Inc., Meriden, Conn.
•Owens-Illinois Glass Co., Toledo, Ohio
Parkway Plastics, Inc., New Market, N. J.
•Pennsylvania Glass Products Co., Pittsburgh
Phoenix Metal Cap Co., Chicago
Rieke Metal Products Corp., Auburn, Ind.
Scovill Mfg. Co., Waterbury, Conn.
Shore, R. W., Mfg. Co., Long Island City, N. Y.
•Sterling Seal Co., Erie, Pa.
Swan Metal Cap Co., Chicago
Tipper Tie Products of New Jersey, Inc., Union, N. J.
West Penn Mfg. & Supply Corp., Brackenridge, Pa.

CLOSURES, METAL
(Tamperproof)

Editorial information, Div. II Sec. 10

•Aluminum Co. of America, Pittsburgh
•American Can Co., Canco Div., New York
•Anchor Hocking Glass Corp., Lancaster, Ohio

•Continental Can Co., Metal Div., New York
Guardian Safety Seal Co., Chicago
•Henlopen Mfg. Co., Brooklyn, N. Y.
•Metal Closures Ltd., West Bromwich, Staffordshire, England
•Owens-Illinois Glass Co., Toledo, Ohio
Rieke Metal Products Corp., Auburn, Ind.
Shore, R. W., Mfg. Co., Long Island City, N. Y.
•Sterling Seal Co., Erie, Pa.
Vac-Tie Fasteners, Inc., Elizabeth, N. J.
West Co., Phoenixville, Pa.

CLOSURES, MOLDED PLASTIC

Editorial information, Div. II Sec. 10

AP Applicator Co., Pleasantville, N. Y.
Alfa Mfg. Co., Chicago
•Anchor Hocking Glass Corp., Lancaster, Ohio
•Animal Trap Co. of America, Lititz, Pa.
Apcon Co., Independence, Mo.
Applicator Co., Brooklyn, N. Y.
•Armstrong Cork Co., Lancaster, Pa.
Bernardin Bottle Cap Co., Evansville, Ind.
Bo-Mer Mfg. Co., Auburn, N. Y.
Bopp-Decker Plastics, Inc., Birmingham, Mich.
Bradley-Sun Div., American Can Co., Union, N. J.
Brilhart Plastics Corp., Mineola, N. Y.
Bruce Molded Plastic Products, Inc., Pittsburgh
Celon Co., Div. Thatcher Glass Mfg. Co., Inc., Muscatine, Iowa
Chicago Wood & Plastic Products, Chicago
Clover Industries, Inc., Tonawanda, N. Y.
•Colonial Applicator Co., Vineland, N. J.
Como Plastics, Inc., Columbus, Ind.
Conart Co., Glen Head, N. Y.
Container Corp. of America, Chicago
Dairy Whipt Div., Aerated Container Corp., Chicago
Dale, John, Ltd., London, England
Denver Plastics, Inc., Golden, Colo.
•Dosamatic Dropper Corp., Freeport, N. Y.
•Dougherty Brothers, Buena, N. J.
Dover Molded Products Co., Dover, Ohio
DuBois Plastic Products, Inc., Buffalo, N. Y.
•Erno Products Co., Philadelphia
Faran Co., New York
Fedco Corp., Chicago
Flyndustries, Inc., New York
•Frank, Walter, Organization, Hillside, Ill.
Garray Plastics, Inc., Kearny, N. J.
Guild Molders, Inc., Elmsford, N. Y.
H & R Plastics Industries, Inc., Nazareth, Pa.
•Henlopen Mfg. Co., Brooklyn, N. Y.
Hydrawlik Co., Roselle, N. J.
•Imco Container Co., Kansas City, Mo.
Injection Molding Corp., New York
Lily-Tulip Cup Corp., New York
Lok-Seal, Inc., New York
Lumelite Corp., Pawling, N. Y.
Madan Plastics, Inc., Cranford, N. J.
Mutual Plastic Mold Corp., South Gate, Calif.
North Star Industries, Inc., Minneapolis
Novelart Mfg. Co., Cincinnati
OEL, Inc., Elizabeth, N. J.
Olympic Plastics Co., Los Angeles
•Owens-Illinois Glass Co., Toledo, Ohio
Parkway Plastics, Inc., New Market, N. J.
•Peerless Tube Co., Bloomfield, N. J.
•Pennsylvania Glass Products Co., Pittsburgh
PharmaPlastics, Inc., Baltimore, Md.
Phoenix Metal Cap Co., Chicago
Pittsburgh Plastics, Div. Heekin Can Co., New Castle, Pa.
Plastic Assembled Products, Inc., Baltimore, Md.
Plasti-Vue Mfg. Co., Fort Worth, Texas
Plast-O-Pak Corp., Leominster, Mass.
•Plax Corp., Hartford, Conn.
Polar Container Corp., Chicago
Polytop Corp., Hingham, Mass.
Rieke Metal Products Corp., Auburn, Ind.
Robinson Plastics Corp., New York
Scott Plastics Corp., Hartford, Conn.
Sealright Co., Fulton, N. Y.
Springman & Wood Co., Passaic, N. J.
Standard Molding Corp., Dayton, Ohio
Tech Art Plastics Co., Morristown, N. J.
Terkelsen Machine Co., Boston
Thatcher Glass Mfg. Co., New York
Tubophane S.A., Paris, France
Tupper Co., Woonsocket, R. I.
Victor Metal Products Corp., Newport, Ark.
Western Coil & Electrical Co., Racine, Wis.
Wheaton Glass Co., Millville, N. J.
Wheaton Plastics Co., Mays Landing, N. J.
Wheeling Stamping Co., Wheeling, W. Va.
Whyte Mfg. Co., New York
Wilpet Tool & Mfg. Co., Kearny, N. J.
•Wirz, A. H., Inc., Chester, Pa.

CLOSURES, PAIL, METAL

Editorial information, Div. V Sec. 17

•Continental Can Co., Metal Div., New York
•Henlopen Mfg. Co., Brooklyn, N. Y.
•Owens-Illinois Glass Co., Toledo, Ohio
Shore, R. W., Mfg. Co., Long Island City, N. Y.
•Standard Packaging Corp., Closure Div., Chicago

CLOSURES, PAPER, FOIL, PLASTICS (Flexible)

Editorial information, Div. II Sec. 10

•Aluminum Co. of America, Pittsburgh
•Auer, J. F., Inc., Mamaroneck, N. Y.
Canada Foils, Ltd., Toronto, Ont.
Central Waxed Paper Co., Div. St. Regis Paper Co., Chicago
Conex Div., Illinois Tool Works, Des Plaines, Ill.
Dale, John, Ltd., London, England
Dickinson, John, & Co., Hemel Hempstead, Herts., England
Dixie Cup Div., American Can Co., Easton, Pa.
•Ekco-Alcoa Containers, Inc., Wheeling, Ill.
Excelsior Transparent Bag Mfg. Co., Yonkers, N. Y.
Flexigrip, Inc., New York
Foilcraft Printing Corp., New York
Gabe-Bert Crafts, Inc., Yonkers, N. Y.
•Henlopen Mfg. Co., Brooklyn, N. Y.
•J. E. Plastics Mfg. Corp., Yonkers, N. Y.
Leedpak, Inc., New York
Lily-Tulip Cup Corp., New York
Lumelite Corp., Pawling, N. Y.
Mid-West-Pak Corp., Belvidere, Ill.
Mutual Plastic Mold Corp., South Gate, Calif.
Novelart Mfg. Co., Cincinnati
Paper Converters Co., Los Angeles
Parkway Plastics, Inc., New Market, N. J.
•Plaxall, Inc., Long Island City, N. Y.
•Reynolds Metals Co., Richmond, Va.
Rieke Metal Products Corp., Auburn, Ind.
Safelon Corp., Yonkers, N. Y.
St. Regis Paper Co., New York
Sealright Co., Fulton, N. Y.
Smith-Lee Co., Oneida, N. Y.
Standard Cap & Seal, Inc., Chamblee, Ga.
•Standard Packaging Corp., Closure Div., Chicago
Thermo-Plastic Products Co., San Carlos, Calif.
Vacuum Plastics Corp., Columbus, Ohio

CLOSURES, PARENTERAL

Editorial information, Div. II Sec. 10

•Aluminum Co. of America, Pittsburgh
•Erno Products Co., Philadelphia
Plastic Assembled Products, Inc., Baltimore, Md.
West Co., Phoenixville, Pa.
Wheaton Glass Co., Millville, N. J.

CLOSURES, POURING SPOUT TYPE

Editorial information, Div. II Sec. 10

Bel-Art Products, Pequannock, N. J.
Braun, W., Co., Chicago
Columbia Basin Plastics Co., No. Hollywood, Calif.
Container Corp. of America, Chicago
Delaware Barrel & Drum Co., Wilmington, Del.
Dripcut Starline Corp., Santa Barbara, Calif.
•Erno Products Co., Philadelphia
Evans Crowder Co., So. Lyon, Mich.
Faran Co., New York
•Frank, Walter, Organization, Hillside, Ill.
•Henlopen Mfg. Co., Brooklyn, N. Y.
Injection Molding Corp., New York
Lumelite Corp., Pawling, N. Y.
Pittsburgh Plastics, Div. Heekin Can Co., New Castle, Del.
Plastic Assembled Products, Inc., Baltimore, Md.
Seal-Spout Corp., Mountainside, N. J.
Shore, R. W., Mfg. Co., Long Island City, N. Y.
Whyte Mfg. Co., New York
•Wirz, A. H., Inc., Chester, Pa.

CLOSURES, SECONDARY CAPS & BANDS

Editorial information, Div. II Sec. 10

•Aluminum Co. of America, Pittsburgh
•American Viscose Corp., Philadelphia
•Armstrong Cork Co., Lancaster, Pa.
Celon Co., Div. Thatcher Glass Mfg. Co., Muscatine, Iowa
Dairy Whipt Div., Aerated Container Corp., Chicago
•du Pont de Nemours, E. I., & Co., Wilmington, Del.

CLOSURES, SECONDARY CAPS & BANDS (Foil)

Editorial information, Div. II Sec. 10

•Aluminum Co. of America, Pittsburgh
Foilcraft Printing Corp., New York
•Milprint, Inc., Milwaukee
Rockford Package & Container Corp., Rockford, Ill.
•Standard Packaging Corp., Johnston Foil Mfg. Div., St. Louis, Mo.
Walsello Products, Inc., Paterson, N. J.

CLOSURES, SUPPLEMENTARY (Bottle Applied)

Editorial information, Div. II Sec. 10

Busse, Robert, & Co., New York
Evans Crowder Co., So. Lyon, Mich.
Rockford Package & Container Corp., Rockford, Ill.
•Standard Packaging Corp., Closure Div., Chicago
West Co., Phoenixville, Pa.

CLOSURES, VACUUM

Editorial information, Div. II Sec. 10

•Aluminum Co. of America, Pittsburgh
•Anchor Hocking Glass Corp., Lancaster, Ohio
Container Corp. of America, Chicago
•Continental Can Co., White Cap Co., Div., Chicago
•Crown Cork & Seal Co., Philadelphia
•Erno Products Co., Philadelphia
•Metal Closures Ltd., West Bromwich Staffordshire, England
Vac-Tie Fasteners, Inc., Elizabeth, N. J.

CLOSURES, WOOD

Editorial information, Div. II Sec. 10, Div. V Sec. 17

AP Applicator Co., Pleasantville, N. Y.
Bogert & Hopper, Inc., New York
Chicago Wood & Plastic Products, Chicago
Estes, E. B., & Sons, New York
•Henlopen Mfg. Co., Brooklyn, N. Y.
Lea, David M., & Co., Richmond, Va.

COATINGS, ASPHALTIC

Editorial information, Div. I Sec. 3

Acro Chemical Products Corp., Long Valley, N. J.
Borden Chemical Co., New York
Daubert Chemical Co., Chicago
DeSoto Chemical Coatings, Inc., Chicago
Illinois Bronze Powder Co., Chicago
Noble, M. J., Co., San Francisco
Pennsylvania Industrial Chemical Corp., Clairton, Pa.
Ruberoid Co., Safepack Mills Div., New York
Sherwin-Williams Co., Pigment, Color & Chemical Div., New York
Union Bag-Camp Paper Corp., New York
Watson-Standard Co., Pittsburgh

COATINGS, PROTECTIVE, PERMANENT

(Bonding)

Editorial information, Div. I Sec. 3, Div. II Sec. 9

Acro Chemical Products Corp., Long Valley, N. J.
•Adcote Chemicals, Inc., Elk Grove, Ill.
Adhesive Products Corp., N. Y.
Ander Chemical Corp., Cincinnati
Atlas Coatings Corp., Long Island City, N. Y.
•Boler Petroleum Co., Ardmore, Pa.
Borden Chemical Co., New York
Bradley & Vrooman Co., Chicago
•Chemical Products Corp., E. Providence, R. I.
Dennis Chemical Co., St. Louis, Mo.
DeSoto Chemical Coatings, Inc., Chicago
•Dow Chemical Co., Midland, Mich.
•du Pont de Nemours, E. I., & Co., Wilmington, Del.
Egyptian Lacquer Mfg. Co., Newark, N. J.
Engelhard Industries, Inc., Newark, N. J.
•Enjay Chemical Co., Div. Humble Oil & Refining Co., New York
Flexcraft Industries, Newark, N. J.
General Adhesives & Chemical Co., Nashville, Tenn.
General Electric Co., Silicone Products Dept., Waterford, N. Y.
General Plastics Corp., Bloomfield, N. J.
•Goodyear Tire & Rubber Co., Akron, Ohio
Gordon-Lacey Chemical Products Co., Maspeth, N. Y.
Hermetite Corp., Carlstadt, N. J.
Interchemical Corp., Finishes Div., Newark, N. J.
Marblette Corp., Long Island City, N. Y.
Minnesota Mining & Mfg. Co., St. Paul, Minn.
Monsanto Chemical Co., St. Louis, Mo.
•Morningstar-Paisley, Inc., New York
Nalco Chemical Co., Chicago
National Starch & Chemical Corp., New York
National Starch & Chemical Co. (Canada), Toronto, Ont.
Noble, M. J., Co., San Francisco
Pennsylvania Industrial Chemical Corp., Clairton, Pa.
Pierce & Stevens Chemical Corp., Buffalo, N. Y.
Polymer Industries, Inc., Springdale, Conn.
Pope & Gray, Inc., Clifton, N. J.
Pyroxylin Products, Inc., Chicago
Raffi & Swanson, Inc., Wilmington, Mass.
Research Sales, Inc., Suffern, N. Y.
Resisto Chemicals, Inc., Wilmington, Del.
Reynolds Chemical Products Co., Whitmore Lake, Mich.
Schwartz Chemical Co., Long Island City, N. Y.
Seal-Peel, Inc., Royal Oak, Mich.
Sherwin-Williams Co., Pigment, Color & Chemical Div., New York
Sonneborn Chemical & Refining Corp., New York
•Standard Packaging Corp., New York
Stoner-Mudge Co., Div. American-Marietta Co., Pittsburgh
Sun Chemical Corp., New York
Synthetasine Protective Coatings, Inc., New York
Synthon, Inc., Cambridge, Mass.
Testworth Laboratories, Inc., Addison, Ill.
Tragacine Adhesives, Leeds, England
Union Carbide Corp., Silicones Div., New York
•United Shoe Machinery Corp., Boston
United States Rubber Co., New York
Virginia Chemical Corp., Lynchburg, Va.
Watson-Standard Co., Pittsburgh
Western Coating Co., Royal Oak, Mich.

COATINGS, PROTECTIVE, REMOVABLE

(Strip Type)

Editorial information, Div. V Sec. 17

•Adcote Chemicals, Inc., Elk Grove, Ill.
Adhesive Products Corp., New York
Atlas Coatings Corp., Long Island City, N. Y.
Bee Chemical Co., Lansing, Ill.
Bradley & Vrooman Co., Chicago
•Chemical Products Corp., E. Providence, R. I.
Cooper, D. C., Co., Chicago
Dennis Chemical Co., St. Louis, Mo.
DeSoto Chemical Coatings, Inc., Chicago
•Dow Chemical Co., Midland, Mich.
•du Pont de Nemours, E. I., & Co., Wilmington, Del.
Eronel Services, Inc., New Milford, Conn.
Flexcraft Industries, Newark, N. J.
General Adhesives & Chemical Co., Nashville, Tenn.
Gordon-Lacey Chemical Products Co., Maspeth, N. Y.
Hermetite Corp., Carlstadt, N. J.
Imperial Chemical Industries Ltd., London, England
Interchemical Corp., Finishes Div., Newark, N. J.
Minnesota Mining & Mfg. Co., St. Paul, Minn.
•Morningstar-Paisley, Inc., New York
National Starch & Chemical Co. (Canada), Toronto, Ont.
Pierce & Stevens Chemical Corp., Buffalo, N. Y.
Pyroxylin Products, Inc., Chicago
Raffi & Swanson, Inc., Wilmington, Mass.
Research Sales, Inc., Suffern, N. Y.
Resisto Chemical, Inc., Wilmington, Del.
Reynolds Chemical Products Co., Whitmore Lake, Mich.
Schwartz Chemical Co., Long Island City, N. Y.
Seal-Peel, Inc., Royal Oak, Mich.
Sherwin-Williams Co., Pigment, Color & Chemical Div., New York
•Standard Packaging Corp., New York
Stoner-Mudge Co., Div. American-Marietta Co., Pittsburgh
Testworth Laboratories, Inc., Addison, Ill.
United Lacquer Mfg. Corp., Linden, N. J.
Virginia Chemical Corp., Lynchburg, Va.
Watson-Standard Co., Pittsburgh
Western Coating Co., Royal Oak, Mich.

COATINGS & FINISHES, DECORATIVE

(Pearl)

Editorial information, Div. I Sec. 3

•Adcote Chemicals, Inc., Elk Grove, Ill.
Ander Chemical Corp., Cincinnati
Atlas Coatings Corp., Long Island City, N. Y.
Bee Chemical Co., Lansing, Ill.
DeSoto Chemical Coatings, Inc., Chicago
Egyptian Lacquer Mfg. Co., Newark, N. J.
Flexcraft Industries, Newark, N. J.
Floquil Products, Inc., Cobleskill, N. Y.
Illinois Bronze Powder Co., Chicago
Interchemical Corp., Finishes Div., Newark, N. J.
Mearl Corp., New York
Pyroxylin Products, Inc., Chicago
Raffi & Swanson, Inc., Wilmington, Mass.
Research Sales, Inc., Suffern, N. Y.
Resisto Chemical, Inc., Wilmington, Del.
Ross & Roberts, Inc., Stratford, Conn.
Schwartz Chemical Co., Long Island City, N. Y.
Sherwin-Williams Co., Pigment, Color & Chemical Div., New York
Stoner-Mudge Co., Div. American-Marietta Co., Pittsburgh
Sun Chemical Corp., New York
•Union Paste Co., Boston
United Lacquer Mfg. Corp., Linden, N. J.
Watson-Standard Co., Pittsburgh

COATINGS & TAPES, SPECIAL

(Heat-Resistant, Non-Sticking)

Editorial information, Div. I Sec. 5, Div. III Sec. 12, 13

Acro Chemical Products Corp., Long Valley, N. J.
•Adcote Chemicals, Inc., Elk Grove, Ill.
Adhesive Products Corp., New York
Bonny Mfg. Co., Maynard, Mass.
Connecticut Hard Rubber Co., New Haven, Conn.
Crown Zellerbach Corp., Multiwall Bag Sales Div., San Francisco
DeSoto Chemical Coatings, Inc., Chicago
Dow Corning Corp., Midland, Mich.
General Electric Co., Silicone Products Dept., Waterford, N. Y.
General Plastics Corp., Bloomfield, N. J.
Gordon-Lacey Chemical Products Co., Maspeth, N. Y.
Minnesota Mining & Mfg. Co., St. Paul
Pierce & Stevens Chemical Corp., Buffalo, N. Y.
Pope & Gray, Inc., Clifton, N. J.
Pyroxylin Products, Inc., Chicago

Resisto Chemical, Inc., Wilmington, Del.
St. Regis Paper Co., New York
Solatech Coating Corp., New Rochelle, N. Y.
•Standard Packaging Corp., General Felt Products Div., Brooklyn, N. Y.
Stoner-Mudge Co., Div. American-Marietta Co., Pittsburgh
Sun Chemical Corp., New York
Vernon Chemical & Mfg. Corp., New York
Virginia Chemical Corp., Lynchburg, Va.
Warren Wire Co., Pownal, Vt.

COLORANTS, PLASTICS

•Westchester Plastics, Inc., Mamaroneck, N. Y.

COMPOUNDS, ANTI-BLOCKING

(Release Agents)

Editorial information, Div. V Sec. 17

A-M-R Chemical Co., Brooklyn, N. Y.
•Adcote Chemicals, Inc., Elk Grove, Ill.
Adhesive Products Corp., New York
Antara Chemicals, Div. General Aniline & Film Corp., New York
Barco Chemical Products Co., Chicago
Borden Chemical Co., New York
Crown Zellerbach Corp., Multiwall Bag Sales Div., San Francisco
Dow Corning Corp., Midland, Mich.
•du Pont de Nemours, E. I., & Co., Wilmington, Del.
•Eastman Chemical Products, Inc., Kingsport, Tenn.
Flexcraft Industries, Newark, N. J.
General Electric Co., Silicone Products Dept., Waterford, N. Y.
Glyco Chemicals, Div. Chas. L. Huisking & Co., New York
Imperial Chemical Industries Ltd., London, England
•Injection Molders Supply Co., Cleveland
Marblette Corp., Long Island City, N. Y.
National Starch & Chemical Co. (Canada), Toronto, Ont.
Nicol, Malcolm, & Co., Hawthorne, N. J.
Noble, M. J., & Co., San Francisco
Pierce & Stevens Chemical Corp., Buffalo, N. Y.
Pyroxylin Products, Inc., Chicago
Randall Duster Corp., Briarcliff Manor, N. Y.
Research Sales, Inc., Suffern, N. Y.
Resisto Chemical, Inc., Wilmington, Del.
Schwartz Chemical Co., Long Island City, N. Y.
Union Carbide Corp., Silicones Div., New York
Virginia Chemical Corp., Lynchburg, Va.

COMPOUNDS, GOLD

(For Glass Decoration)

Editorial information, Div. II Sec. 10

•du Pont de Nemours, E. I., & Co., Wilmington, Del.
Flexcraft Industries, Newark, N. J.
Illinois Bronze Powder Co., Chicago

COMPOUNDS, ULTRAVIOLET ABSORBERS

(For Coatings)

American Cyanamid Co., Intermediates Dept., Bound Brook, N. J.
Antara Chemicals, Div. General Aniline & Film Corp., New York
•Eastman Chemical Products, Inc., Kingsport, Tenn.
Geigy Industrial Chemicals, Div. Geigy Chemical Corp., Ardsley, N. Y.

CONTAINER-BOARD

A. Fourdrinier Kraft Liner
B. Jute Liner

Editorial information, Div. V Sec. 17

Albemarle Paper Mfg. Co., Richmond, Va. (A)
American Paper Products Co., Philadelphia (B)
Container Corp. of America, Chicago (A, B)
Cornell Paperboard Products Co., Div. St. Regis Paper Co., Milwaukee (A, B)
Crown Zellerbach Corp., Industrial Paper Sales Div., San Francisco (A)
Flintkote Co., Los Angeles (B)
Georgia-Pacific Paper Co., Portland, Ore. (A)
Gilman Paper Co., New York (A)
•International Paper Co., New York (A)
Lawrence Paper Co., Lawrence, Kan. (B)
Longview Fibre Co., Longview, Wash. (A)
Mead Board Sales, Inc., Cincinnati (A, B)
Metal Edge Industries, Barrington, N. J. (A)
•Olin, Packaging Div., Forest Products Operations, W. Monroe, La. (A)
•Owens-Illinois Glass Co., Toledo, Ohio (A)
•Packaging Corp. of America, Evanston, Ill. (A, B)
Potlatch Forests, Inc., Lewiston, Idaho (A)
•Riegel Paper Corp., New York (A)
River Raisin Paper Co., Div. Union Bag-Camp Paper Corp., Monroe, Mich. (B)
St. Regis Paper Co., New York (A)
Stone Container Corp., Chicago (B)
Strange, John, Paper Co., Menasha, Wis. (B)
Waldorf Paper Products Co., St. Paul, Minn. (A)
•West Virginia Pulp & Paper Co., New York (A)
Weston Paper & Mfg. Co., Dayton, Ohio (B)
Weverhaeuser Co., Shipping Container Div., Chicago (A, B)

CORES, PAPER OR FIBRE

Editorial information, Div. II Sec. 6

American Paper Products Co., Philadelphia
Baxter, J. C., Co., Minerva, Ohio
Chicago Mailing Tube Co., Chicago
•Cleveland Container Co., Cleveland
Climax Fibre Drum, Carthage, N. Y.
Consolidated Box Co., Tampa, Fla.
Container Corp. of America, Chicago
Crescent Paper Tube Co., Covington, Ky.
Gardiner Paper Mills, Gardiner, Maine
Industrial Steel & Fibre Ltd., Montreal, Que.
•International Paper Co., New York
Longview Fibre Co., Longview, Wash.
Maine Paper Tube Corp., Gardiner, Maine
Master Package Corp., Owen, Wis.
Mead Board Sales, Inc., Cincinnati
Ohio Paper Products Co., Massillon, Ohio
•Packaging Corp. of America, Evanston, Ill.
Penland Paper Converting Corp., Hanover, Pa.
Platt Corp., Baltimore, Md.
Queen City Paper Co., Cincinnati
R. C. Can Co., St. Louis, Mo.
Round Tubes & Cores Co., Chicago
Sefton Fibre Can Div., Container Corp. of America, St. Louis, Mo.
Sonoco Products Co., Hartsville, S. C.
Spenzer Container Corp., Greenville, Pa.
Stone Container Corp., Chicago
Stone Paper Tube Co., Washington, D. C.
Stonington Paper Tube Co., Holyoke, Mass.
Strange, John, Paper Co., Menasha, Wis.
United Container Co., Philadelphia

CORK SHEETS

(Paper-Backed)

Editorial information, Div. V Sec. 17

Cork Products Co., New York
•Erno Products Co., Philadelphia
•Henlopen Mfg. Co., Brooklyn, N. Y.
•Standard Packaging Corp., General Felt Products Div., Brooklyn, N. Y.

CORKS

(Plain, Aluminum-, Molded- or Wood-Top)

Editorial information, Div. II Sec. 10

American Star Cork Co., Brooklyn, N. Y.
•Armstrong Cork Co., Lancaster, Pa.
Cork Products Co., New York
•Erno Products Co., Philadelphia
•Henlopen Mfg. Co., Brooklyn, N. Y.

CUSHIONING MATERIALS

A. Animal Hair, Bonded
B. Padding & Wadding
C. Sponge Rubber

(For Foam Materials, see Foams, Plastic)

Editorial information, Div. V Sec. 17

Airpak, Hawthorne, N. J. (B)
American Excelsior Corp., Chicago (A, B)
American Latex Fibre Corp., Lawrence, Mass. (A, B)
Armour Alliance Industries, Alliance, Ohio (A)
Bennett Products, Inc., Rockford, Ill. (B)
Bestpak, Inc., Natick, Mass. (B)
Blocksom & Co., Michigan City, Ind. (A, B)
Boyertown Packaging Service Corp., Boyertown, Pa. (B)
Burkart, F., Mfg. Co., St. Louis, Mo. (A, B)
•Cel-Fibe Div., Personal Products Corp., Milltown, N. J. (B)
Chicago Curled Hair Co., Chicago (A)
Connecticut Hard Rubber Co., New Haven, Conn. (C)
Flex-O-Lators, Inc., Carthage, Mo. (B)
Fulton Cotton Mills, Atlanta, Ga. (B)
Goldman, Harry, Co., New York (C)
Henle Wax Paper Mfg. Co., Bronx, N. Y. (B)
Holland Insulated Wire & Cable Works Ltd., Amsterdam, Holland (B)
Interplastics Corp., Jackson Heights, N.Y. (B)
•Jiffy Mfg. Co., Hillside, N. J. (B)
Janesville Cotton Mills, Norwalk, Ohio (A, B)
Johns-Manville, New York (C)
Keiding Paper Products Co., Milwaukee (B)
•Keyes Fibre Co., Waterville, Maine (B)
Kieffer Paper Mills, Brownstown, Ind. (B)
Kimberly-Clark Corp., Neenah, Wis. (B)

Melrose Packaging Corp., Flushing, N. Y. (B)
Nash-Hammond, Inc., El Monte, Calif. (A, B)
•Nichols Paper Products Co., Green Bay, Wis. (B)
•Packaging Components, Inc., New York (B)
Paper Converters Co., Los Angeles (B)
Paper Products Mfg. Co., Swarthmore, Pa. (B)
Preservation Packaging, Inc., Hillside, N. J. (B)
R. & R. Paper Converting Co., Los Angeles (B)
St. Regis Paper Co., New York (B)
Stearns & Foster Co., Cincinnati (B)
Sweetnam, George H., Inc., Cambridge, Mass. (B)
Technifoam Corp., New York (B)
Union Wadding Co., Pawtucket, R. I. (B)
Vanant Co., Milwaukee (B)
Wood Conversion Co., St. Paul, Minn. (B)

DECALCOMANIA TRANSFERS

(See also Labels, Decalcomania)

Editorial information, Div. IV Sec. 15, 16

•American Tag Co., Belleville, N. J.
Brady, W. H., Co., Milwaukee
Braun, W., Co., Chicago
•Ludlow Corp., Needham Heights, Mass.
Mayer, Frank, & Associates, Milwaukee
Meyercord Co., Chicago
Morse Decals, Los Angeles
Packaging Pioneers, Inc., Tuckahoe, N. Y.
Palm Bros. Decalcomania Co., Cincinnati
Rollprint Products Corp., Chicago
Spielman Co., Philadelphia
Topflight Corp., York, Pa.

DESICCANTS, DEHYDRATING AGENTS

Editorial information, Div. V Sec. 17

Abbeon, Inc., Jamaica, N. Y.
Culligan, Inc., Northbrook, Ill.
DriAire, Inc., E. Norwalk, Conn.
Dryomatic Corp., Alexandria, Va.
Filtrol Corp., Los Angeles
Grace, W. R., & Co., Davison Chemical Div., Baltimore, Md.
Hurwich, R., Co., Berkeley, Calif.
Merix Chemical Co., Chicago
Socony Mobil Oil Co., New York
Twitchell, E. W., Inc., Packaging Div., Philadelphia

DESTATICIZERS, LIQUID

Merix Chemical Co., Chicago
•Statikil, Inc., Cleveland

EXCELSIOR

A. Paper, Cellophane
B. Wood

Editorial information, Div. V Sec. 17

American Excelsior Corp., Chicago (A, B)
American Industries Co., Div. American Shredded Paper Co., Boston (A)
Brooks Paper Co., St. Louis, Mo. (A)
•Crystal Tissue Co., Middletown, Conn. (A)
KVP Sutherland Paper Co., Kalamazoo, Mich. (A)
Microfibres, Inc., Pawtucket, R. I. (A)
Modern Transparent Mfg. Co., W. Pittston, Pa. (A)
Newark Paraffine Paper Co., Newark, N. J. (A)

FABRICS

(For Box Wraps, Linings & Displays)

Acro Chemical Products Corp., Long Valley, N. J.
Chicopee Mfg. Corp., Milltown, N. J.
•Dyna-Foam Div., Sun Chemical Corp., Ellenville, N. Y.
Facile Corp., Sub. Sun Chemical Corp., Paterson, N. J.
Farrington Texol Corp., Walpole, Mass.
Frankel Associates, Inc., New York
Fulton Cotton Mills, Atlanta, Ga.
Maharam Fabric Corp., New York
Mautner Co., New York
Shopsin Paper Co., New York
Sun Chemical Corp., New York
Textileather Div., General Tire & Rubber Co., Toledo, Ohio

FIBROUS GLASS REINFORCEMENT

(For Papers & Tapes)

Editorial information, Div. I Sec 5

Pittsburgh Plate Glass Co., Pittsburgh

FILMS, CELLOPHANE

Editorial information, Div. I Sec. 4

•American Viscose Corp., Philadelphia
British Cellophane Ltd., London, England
British Rayophane Ltd., London, England
•du Pont de Nemours, E. I., & Co., Wilmington, Del.
Kalle A. G., Wiesbaden, Germany
•La Cellophane S.A., Paris, France
•Olin, Packaging Div., Film Operations, New York
Transparent Paper Ltd., London, England

FILMS, PLASTIC

A. Biaxially-Oriented Polystyrene
B. Butyrate
C. Cellophane, Polyethylene-Coated
D. Cellulose Acetate
E. Fluorocarbon
F. Methyl Cellulose
G. Nylon (Polyamide)
H. Pliofilm
I. Polyester
J. Polyethylene
K. Polypropylene
L. Polystyrene
M. Polyvinyl Alcohol
N. Saran & saran modifications
O. Vinyl (vinyl chloride & vinyl copolymers)

Editorial information, Div. I Sec. 4

A B C Cellophane Co., Div. Rapid Container Corp., Brooklyn, N. Y. (C, D, J, K, L)
Acme Cellophane Converting Corp., Temple City, Calif. (A, C, D, H, J, K, N)
American Cellophane & Plastic Films Corp., Boston (J)
American Pyroxylin Corp., Arlington, N. J. (D)
American Sisalkraft Corp., Attleboro, Mass. (J)
•American Viscose Corp., Philadelphia (C, N)
Andmar Plastic Co., Clifton, N. J. (J)
•AviSun Corp., Philadelphia (K)
Bemis Bro. Bag Co., St. Louis, Mo. (J)
Blossom Mfg. Co., Brooklyn, N. Y. (J, O)
Bonny Mfg. Co., Maynard, Mass. (E, G)
British Cellophane Ltd., London, England (A, C, G, J, K, M, O)
COSECO, Los Angeles (J)
•Campco Div., Chicago Molded Products Corp., Chicago (B, D, L)
Canton Containers, Inc., Canton, Ohio (J)
Castco, Inc., Long Island City, N. Y. (J)
•Celanese Plastics Co., Div., Celanese Corp. of America, Newark, N. J. (D, J)
Cello Bag Co., Seattle, Wash. (J)
•Cellu-Craft Products Corp., New Hyde Park, N. Y. (C, D, G, H, I, J, K)
Chippewa Plastics Co., Div. Rexall Drug & Chemical Co., Chippewa Falls, Wis. (J)
•Clopay Corp., Cincinnati (J, O)
•Continental Can Co., Flexible Packaging Div., Mt. Vernon, Ohio (C, J)
Crown Zellerbach Corp., Western-Waxide Div., San Leandro, Calif. (C, J)
Crystal-X Corp., Lenni Mills, Pa. (J)
Dale, John, Ltd., London, England (O)
Davidson Products Co., Seattle, Wash. (J)
•Davis, Joseph, Plastics Co., Kearny, N. J. (A, B, D, K, L)
•Dobeckmun Co., Div. Dow Chemical Co., Cleveland (J, L, N)
•Dow Chemical Co., Midland, Mich. (A, F, J, L, N)
•du Pont de Nemours, E. I., & Co., Wilmington, Del. (D, E, I, J)
•Eastman Kodak Co., Rochester, N. Y. (D)
Elm Coated Fabrics Co., New York (K, O)
Extrudo Film Corp., New York (J, K)
Fabricon Products, River Rouge, Mich. (J, K)
Favorite Plastic Corp., Brooklyn, N. Y. (J)
Firestone Plastics Co., Div. Firestone Tire & Rubber Co., Pottstown, Pa. (J, O)
•Flex-O-Glass, Inc., Chicago (B, J, K, O)
Food Film, Inc., Pine Brook, N. J. (J)
Foster Grant Co., Leominster, Mass. (G)
•General Chemical Div., Allied Chemical Corp., New York (E, G)
Gering Plastics, Kenilworth, N. J. (J)
Goodrich, B. F., Industrial Products Co., Akron, Ohio (O)
•Goodyear Tire & Rubber Co., Akron, Ohio (H, I, O)
Gordon-Lacey Chemical Products Co., Maspeth, N. Y. (O)
Grace, W. R., & Co., Cryovac Div., Cambridge, Mass. (J, K, O)
H & R Plastics Industries, Inc., Nazareth, Pa. (G, J, K)
Harte & Co., New York (J, O)
Hercules Powder Co., Wilmington, Del. (K)
Holland Insulated Wire & Cable Works Ltd., Amsterdam, Holland (J, O)
Kalle A. G., Wiesbaden, Germany (D, G, I, J, K, M, O)
Keystone Packaging Service, Inc., Philipsburg, N. J. (J)
Kleartone Transparent Products Co., Westbury, N. Y. (J)
•Koppers Co., Pittsburgh (I)
•Kordite Co., Div. National Distillers & Chemical Corp., Macedon, N. Y. (J, K)
•La Cellophane, Paris, France (C, J, O)
Lacollonge-Flexone, Paris, France (A, J, O)
Lamex, Inc., Norcross, Ga. (C, J, K)
•Ludlow Corp., Needham Heights, Mass. (G, J, K)
M & Q Plastic Products, Freehold, N. J. (G)

Micron Plastics Corp., Brooklyn, N. Y. (J)
Midwest Plastics Products Co., Chicago Heights, Ill. (B, D, J, K)
•Milprint, Inc., Milwaukee (J)
Minnesota Mining & Mfg. Co., St. Paul, Minn. (I)
Modern Packaging, Inc., Mt. Holly, N. J. (C)
•Mono-Sol Corp., Gary, Ind. (M)
Monsanto Chemical Co., St. Louis, Mo. (D, O)
Montecatini, Milano, Italy (I, K)
•Nixon-Baldwin Chemicals, Inc., Nixon, N. J. (B, D, J, K, L, O)
•Olin, Packaging Div., Film Operations, New York (J)
Organico S.A., Paris, France (G)
Packaging Products & Design Corp., Newark, N. J. (J)
Phillips-Joanna Co., Skokie, Ill. (J)
Pierson Industries, Inc., Boston (J)
Plastic Film Co., Plainfield, Conn. (M)
•Plastic Packaging Co., Chicago (J)
Plasti-Form, Inc., Phillipsburg, N. J. (J, K)
•Plax Corp., Hartford, Conn. (A)
Plicose Mfg. Corp., New York (J, K)
Pollock Paper Co., Div. St. Regis Paper Co., Dallas, Texas (J, K)
Poly Plastic Products, Inc., Paterson, N. J. (J, K)
Polyethylene Corp., of America, Cranbury, N. J. (J)
Polyflex Bag & Container, Inc., Johnstown, N. Y. (J, K)
Poly-Pak, Inc., St. Louis, Mo. (J)
•Queen Transparent Specialties Co., Chicago (A, C, H, I, J, K, M, O)
Ralston, W., & Co. (Canada), Montreal, Que. (J)
Rap Industries, Inc., Minneapolis (C)
Reliance Plastic & Chemical Corp., Paterson, N. J. (J, K)
Rexall Drug & Chemical Co., Film Div., Paramus, N. J. (J)
•Reynolds Metals Co., Richmond, Va. (M, O)
•Riegel Paper Corp., New York (C)
Robeco Chemicals, Inc., New York (O)
Ross & Roberts, Inc., Stratford, Conn. (J, O)
Rubber Corp. of America, New York (O)
Sealcraft Products Corp., Milwaukee (C, J, K)
•Smith, H. P., Paper Co., Chicago (C)
Southern Plastics Co., Columbia, S. C. (B, D, J, K, L)
•Standard Packaging Corp., Flexible Packaging Div., Clifton, N. J. (C)
Tee-Pak, Inc., Chicago (A, G, H, I, L, M, N, O)
Texas Plastics, Inc., Elsa, Texas (J, K)
Transparent Paper Ltd., London, England (C)
•Union Carbide Plastics Co., Div. Union Carbide Corp., New York (O)
United States Rubber Co., Naugatuck Chemical Div., Naugatuck, Conn. (O)
Vernon Chemical & Mfg. Corp., New York (J)
Visking Co., Plastic Films, Div. Union Carbide Corp., Chicago (A, J, K, L)
Walsello Products, Inc., Paterson, N. J. (C)
Webster Industries, Salem, Mass. (J)

FILMS, PLASTIC, SHRINKABLE

Editorial information, Div. I Sec. 1

•Dobeckmun Co., Div. The Dow Chemical Co., Cleveland
•Dow Chemical Co., Midland, Mich.
•du Pont de Nemours, E. I., & Co., Wilmington, Del.
•Goodyear Tire & Rubber Co., Akron, Ohio
Grace, W. R., & Co., Cryovac Div., Cambridge, Mass.
•Mehl Mfg. Co., Cincinnati
•Plax Corp., Hartford, Conn.
Reynolds Metals Co., Richmond, Va.
•Union Carbide Plastics Co., Div. Union Carbide Corp., New York

FLOCK

Editorial information, Div. I Sec. 3, Div. IV Sec. 15

Advance Process Supply Co., Chicago
Atlantic Powdered Metals, New York
Atlas Silk Screen Supply Co., Chicago
Cellusuede Products, Inc., Rockford, Ill.
•Claremont Flock Corp., Claremont, N. H.
Flock Process Co., Norwalk, Conn.
•Lachman-Novasel-Owens Paper Corp., New York
Microfibres, Inc., Pawtucket, R. I.

FLUORESCENT WHITENING AGENTS

(For Board & Paper)

•American Cyanamid Co., Dyes Dept., Bound Brook, N. J.
Geigy Industrial Chemicals, Div. Geigy Chemical Corp., Ardsley, N. Y.
General Dyestuff Co., Div. General Aniline & Film Corp., New York
Imperial Chemical Industries Ltd., London, England

FOAMS, PLASTIC

A. Expandable Polystyrene (Beads)
B. Expanded Polystyrene
C. Extruded Polystyrene
D. Polyethylene
E. Polyurethane (Resins)

Editorial information, Div. II Sec. 8

Air-O-Plastik Corp., Union City, N. J. (B, D, E)
American Excelsior Corp., Chicago (E)
American Latex Fibre Corp., Lawrence, Mass. (E)
Armour Alliance Industries, Alliance, Ohio (E)
•Armstrong Cork Co., Lancaster, Pa. (A)
Blocksom & Co., Michigan City, Ind. (E)
Burkart, F., Mfg. Co., St. Louis, Mo. (E)
Dayco Corp., Dayton, Ohio (E)
Denver Plastics, Inc., Golden, Colo. (A)
De Soto Chemical Coatings, Inc., Chicago (E)
•Dow Chemical Co., Midland, Mich. (A, B, D, E)
•du Pont de Nemours, E. I., & Co., Wilmington, Del. (E)
Durez Plastics Div., Hooker Chemical Corp., No. Tonawanda, N. Y. (E)
Duval Industries, Winthrop, Mass. (A)
•Dyna-Foam Div., Sun Chemical Corp., Ellenville, N. Y. (C)
Expandex Corp., Wauregan, Conn. (B)
•Frank, Walter, Organization, Hillside, Ill. (E)
General Foam Corp., New York (E)
General Foam Plastics Corp., Portsmouth, Va. (B)
General Latex & Chemical Corp., Cambridge, Mass. (E)
General Plastics Corp., Los Angeles (A)
Gilman Brothers Co., Gilman, Conn. (B)
Glo-Brite Foam Plastics, Inc., Chicago (B)
Goldman, Harry, Co., New York (E)
H & R Plastics Industries, Inc., Nazareth, Pa. (D)
Holland Insulated Wire & Cable Works Ltd., Amsterdam, Holland (D)
Isocyanate Products, Inc., New Castle, Del. (E)
•Koppers Co., Pittsburgh (A)
Leewood Corp., Lowell, Mass. (E)
Marblette Corp., Long Island City, N. Y. (E)
Modern-Miltex Corp., New York (B)
Monsanto Chemical Co., St. Louis, Mo. (A, B)
Nesbit Industries, Inc., Chicago (B)
Nopco Chemical Co., Plastics Div., No. Arlington, N. J. (E)
Specialty Converters, Inc., E. Braintree, Mass. (E)
Superior Plastics, Inc., Chicago (B)
Technifoam Corp., New York (E)
Thomas Plastikraft Corp., New Hartford, N. Y. (B)
•Union Carbide Plastics Co., Div. Union Carbide Corp., New York (D)
United States Rubber Co., New York (E)

FOIL

A. Coated, Laminated, Etc.
B. Embossed, Printed & Decorated

Editorial information, Div. I Sec. 4

ADhere Corp., Cincinnati (B)
Alufoil Products Co., New York (A, B)
•Aluminum Co. of America, Pittsburgh (A, B)
•Anaconda Aluminum Co., Louisville, Ky. (A)
Anodyne, Inc., No. Miami Beach, Fla. (A, B)
•Auer, J. F., Inc., Mamaroneck, N. Y. (B)
Bagphane Corp., Flushing, N. Y. (A, B)
Ben-Mont, The Dow Chemical Co., Dobeckmun Div., Bennington, Vt. (A, B)
Boyertown Packaging Service Corp., Boyertown, Pa. (A, B)
Canada Foils Ltd., Toronto, Ont. (A, B)
Catty, H. D., Corp. of New York, Norwalk, Conn. (A, B)
Cello Bag Co., Seattle, Wash. (A, B)
•Cellu-Craft Products Corp., New Hyde Park, N. Y. (A, B)
Chase Bag Co., New York (A)
Chicago Printed String Co., Chicago (B)
•Consolidated Aluminum Corp., Jackson, Tenn. (A, B)
Container Corp., of America, Chicago (A)
•Continental Can Co., Flexible Packaging Div., Mt. Vernon, Ohio (A, B)
Crocker, H. S., Co., San Bruno, Calif. (B)
Crown Zellerbach Corp., Western-Waxide Div., San Leandro, Calif. (A, B)
Crystal Tube Corp., Chicago (B)
Daniels Mfg. Co., Rhinelander, Wis. (A, B)
Dejonge, Louis, & Co., New York (A, B)
Dekcraft Corp., Syosset, N. Y. (B)
Dixie Wax Paper Co., Dallas, Texas (A, B)
•Dobeckmun Co., Div. Dow Chemical Co., Cleveland (A)
Durapak Mfg. Co., Baltimore, Md. (B)
Eureka Specialty Printing Co., Scranton, Pa. (B)
Facile Corp., Sub. Sun Chemical Corp., Paterson, N. J. (A, B)
Fasson Products, Div. Avery Adhesive Products, Inc., Painesville, Ohio (A)
Feder Industries, Inc., New York (B)
Fisher's Foils Ltd., Wembley, Middx., England (A, B)
Foilcraft Printing Corp., New York (B)
•Foils Packaging Corp., Cincinnati (A, B)
Formed Container Corp., Sub. Phillips Petroleum Co., Orangeburg, N. Y. (A, B)
•Frank, Walter, Organization, Hillside, Ill. (B)
Gummed Products Co., Div. St. Regis Paper Co., Troy, Ohio (A)
Hampden Glazed Paper & Card Co., Holyoke, Mass. (A, B)

Hazen Paper Co., Holyoke, Mass. (A, B)
Holland Insulated Wire & Cable Works Ltd., Amsterdam, Holland (B)
House of Harley, Inc., New York (B)
Hueck & Buren, Ludenscheid, Germany (A, B)
•Kaiser Aluminum & Chemical Sales, Inc., Oakland, Calif. (A, B)
Kupfer Bros. Co., New York (A, B)
•Lachman-Novasel-Owens Paper Corp., New York (A, B)
Laminated Paper Products, Santa Clara, Calif. (A)
Lechner Pulp & Paper Co., Teaneck, N. J. (A, B)
Leedpak, Inc., New York (A)
•Ludlow Corp., Needham Heights, Mass. (A)
Marvellum Co., Holyoke, Mass. (A, B)
•Milprint, Inc., Milwaukee (A, B)
Minerva Wax Paper Co., Minerva, Ohio (A)
Mirro Aluminum Co., Manitowoc, Wis. (A)
Modern Packaging, Inc., Mt. Holly, N. J. (A, B)
National Foil Co., Elizabeth, N. J. (A, B)
Newark Foils, Inc., Newark, N. J. (A, B)
Norca Corp., New York (A, B)
Orchard Paper Co., St. Louis, Mo. (A, B)
Organico S.A., Paris, France (A)
Package Products Co., Charlotte, N. C. (B)
Packaging Pioneers, Inc., Tuckahoe, N. Y. (B)
Paperboard Laminating Corp., Norwalk, Conn. (A)
Plastic Film Co., Plainfield, Conn. (A)
Protective Coatings Corp., Clifton, N. J. (A)
Puritan Packaging Corp., Columbus, Ohio (A, B)
Raisin, John T., Corp., San Francisco (A, B)
Rap Industries, Inc., Minneapolis (A, B)
Revere Copper & Brass, Inc., New York (A, B)
•Reynolds Metals Co., Richmond, Va. (A, B)
•Riegel Paper Corp., New York (A)
Roval Paper Corp., New York (A, B)
Ruberoid Co., Safepak Mills Div., New York (A)
Rupaco Paper Corp., Brooklyn, N. Y. (A, B)
Safelon Corp., Yonkers, N. Y. (A)
St. Louis Lithographing Co., St. Louis, Mo. (B)
St. Regis Paper Co., New York (A, B)
Salwen Paper Co., Brooklyn, N. Y. (A, B)
Sealcraft Products Corp., Milwaukee (A)
Shopsin Paper Co., New York (A, B)
Specialty Papers Co., Dayton, Ohio (A)
Standard Insulation Co., E. Rutherford, N. J. (A)
•Standard Packaging Corp., New York (A, B)
Star Aluminium Co., Wolverhampton, England (A, B)
Stecher-Traung Lithograph Corp., Rochester, N. Y. (B)
Stern, H. C., Ltd., London, England (A, B)
Talmadge Printing Co., New York (B)
•Thilmany Pulp & Paper Co., Kaukauna, Wis. (A, B)
Topflight Corp., York, Pa. (B)
Unger Laminating Co., Brooklyn, N. Y. (A, B)
Union Bag-Camp Paper Corp., New York (A, B)
U. S. Steel Supply Div., United States Steel Corp., Chicago (B)
VanPak Products, Inc., Tomah, Wis. (A)
Venesta Foils Ltd., London, England (A, B)
Wachusett Converters, Inc., Leominster, Mass. (B)
Western Foil Co. of Seattle, Seattle, Wash. (A, B)
Western Foil Converters, Berkeley, Calif. (A, B)
Wrapture, Inc., Flushing, N. Y. (B)

FOIL & SHEET, ALUMINUM

(Unsupported)

A. Foil
B. Sheet

Editorial information, Div. I Sec. 4

Alufoil Products Co., New York (A)
•Aluminum Co. of America, Pittsburgh (A, B)
•Anaconda Aluminum Co., Louisville, Ky. (A, B)
Anodyne, Inc., No. Miami Beach, Fla. (A, B)
Catty, H. D., Corp. of New York, Norwalk, Conn. (A)
•Consolidated Aluminum Corp., Jackson, Tenn. (A, B)
Fisher's Foils Ltd., Wembley, Middx., England (A, B)
Hueck & Buren, Ludenscheid, Germany (A, B)
•Kaiser Aluminum & Chemical Sales, Inc., Oakland, Calif. (A, B)
National Foil Co., Elizabeth, N. J. (A)
Republic Foil, Inc., Danbury, Conn. (A, B)
Revere Copper & Brass, Inc., New York (A, B)
•Reynolds Metals Co., Richmond, Va. (A, B)
•Standard Packaging Corp., Johnston Foil Mfg. Div., St. Louis, Mo. (A, B)
Star Aluminium Co., Wolverhampton, England (A, B)
Stern, H. C., Ltd., London, England (A, B)
Venesta Foils Ltd., London, England (A, B)
Western Foil Co. of Seattle, Seattle, Wash. (A)
Western Foil Converters, Inc., Berkeley, Calif. (A)

GLASS, ROD & TUBING

Editorial information, Div. II Sec. 10

Corning Glass Works, Corning, N. Y.
Demuth Glass Works, Inc., Parkersburg, W. Va.
•Owens-Illinois Glass Co., Toledo, Ohio
Palo Laboratory Supplies, Inc., New York
•Pennsylvania Glass Products Co., Pittsburgh
Special Glass Products Co., New York

GLUE

(See Adhesives)

HEAT SEALING COMPOUNDS & SUPPLIES

Editorial information, Div. I Sec. 5, Div. III Sec. 12

Acro Chemical Products Corp., Long Valley, N. J.
•Adcote Chemicals, Inc., Elk Grove, Ill.
Adhesive Products Corp., New York
Ander Chemical Corp., Cincinnati
Atwood Adhesives, Inc., Seattle, Wash.
•Boler Petroleum Co., Ardmore, Pa.
Borden Chemical Co., New York
•Dow Chemical Co., Midland, Mich.
Dreyfus, L. A., Co., So. Plainfield, N. J.
General Plastics Corp., Bloomfield, N. J.
Gordon-Lacey Chemical Products Co., Maspeth, N. Y.
Heat Sealing Equipment Mfg. Co., Cleveland
Hermetite Corp., Carlstadt, N. J.
Imperial Adhesives, Cincinnati
Imperial Chemical Industries Ltd., London, England
Interchemical Corp., Finishes Div., Newark, N. J.
•Morningstar-Paisley, Inc., New York
National Starch & Chemical Corp., New York
National Starch & Chemical Co. (Canada), Toronto, Ont.
Nicol, Malcolm, & Co., Hawthorne, N. J.
Pierce & Stevens Chemical Corp., Buffalo, N. Y.
Polymer Industries, Inc., Springdale, Conn.
Pyroxylin Products, Inc., Chicago
Roma Adhesives, Inc., E. Newark, N. J.
Slick Products, New York
Socony Mobil Oil Co., New York
Sonneborn Chemical & Refining Corp., New York
Southern Adhesives Corp., Richmond, Va.
Stoner-Mudge Co., Div. American-Marietta Co., Pittsburgh
Terrell Corp., Wilmington, Mass.
Testworth Laboratories, Inc., Addison, Ill.
Virginia Chemical Corp., Lynchburg, Va.

HINGES & CATCHES, METAL

Editorial information, Div. II Sec. 6, 8

Geissel Mfg. Co., Hillside, N. J.

INKS, MARKING & STENCIL

Editorial information, Div. III Sec. 13, Div. IV Sec. 15

Acro Tool & Die Works, Chicago
Advance Process Supply Co., Chicago
Ander Chemical Corp., Cincinnati
•Apex Machine Co., College Point, N. Y.
Automatic Marking Equipment, Inc., New York
Bates Mfg. Co., W. Orange, N. J.
Bayberry Products Corp., Stamford, Conn.
•Bell-Mark Corp., Bloomfield, N. J.
Bond Adhesives Co., Jersey City, N. J.
Braden-Sutphin Ink Co., Cleveland
Cozzone Marking Co., Newark, N. J.
Diagraph-Bradley Industries, Inc., Herrin, Ill.
Easy-Mark, Inc., Lowell, Mass.
Flint Ink Corp., Detroit
Floquil Products, Inc., Cobleskill, N. Y.
Force, Wm. A., & Co., Brooklyn, N. Y.
•Gottscho, Adolph, Inc., Hillside, N. J.
Ideal Stencil Machine Co., Belleville, Ill.
Illinois Bronze Powder Co., Chicago
•Industrial Marking Equipment Co., Brooklyn, N. Y.
•Interchemical Corp., Printing Ink Div., New York
International Eastern Co., New York
Kiwi Coders Corp., Chicago
•Markem Machine Co., Keene, N. H.
Marsh Stencil Machine Co., Belleville, Ill.
Matthews, Jas. H., & Co., Pittsburgh
Melind, Louis, Co., Chicago
Muskegon Marking Equipment Co., Packaging Supplies Div., Muskegon, Mich.
Pannier Corp., Pittsburgh
Pioneer Printing Ink Corp., Monroe, Mich.
Pryor Marking Products, Chicago
Research Sales, Inc., Suffern, N. Y.
Resisto Chemical, Inc., Wilmington, Del.
Roberts, Lewis, Inc., Newark, N. J.
Schwartz Chemical Co., Long Island City, N. Y.

Speedry Chemical Products, Inc., Richmond Hill, N. Y.
•Standard Packaging Corp., New York
Superior Marking Equipment Co., Chicago
•Switzer Brothers, Inc., Cleveland
Time-Saving Specialties, Minneapolis
Tubophane S.A., Paris, France
Weber Marking Systems, Inc., Mount Prospect, Ill.

INKS, PRINTING

A. *Flexographic*
B. *Fluorescent*
C. *Gravure*
D. *Letterpress*
E. *Lithographic*
F. *Offset Prevention Powders*
G. *Special*

Editorial information, Div. IV Sec. 15

Acheson Dispersed Pigments Co., Philadelphia (A, C)
Acme Printing Ink Co., Chicago (A, B, C, D, E, G)
Ander Chemical Corp., Cincinnati (A, B, C, D, E, G)
•Apex Machine Co., College Point, N. Y. (A, G)
Atlantic Powdered Metals, Inc., New York (A, C, D, E, G)
Atlas Coatings Corp., Long Island City, N. Y. (C)
Atlas Silk Screen Supply Co., Chicago (B, G)
•Bell-Mark Corp., Bloomfield, N. J. (A, G)
Borden Chemical Co., New York (A, B, C, E, G)
Braden-Sutphin Ink Co., Cleveland (B, D, E, G)
Burton Packaging Co., Brooklyn, N. Y. (D)
California Ink Co., San Francisco (A, B, C, D, E, F, G)
Carlson, John P., Inc., Brooklyn, N. Y. (B, C, D, E)
Century Printing Ink Co., Englewood, N. J. (A, B, C, D, E)
Claremont Pigment Dispersion Corp., Roslyn Heights, N. Y. (A, C)
Colora Printing Inks, Inc., Long Island City, N. Y. (A, C, G)
Converters Ink Co., Linden, N. J. (A, B, C)
Cozzone Marking Co., Newark, N. J.
Crescent Ink & Color Co. of Pa., Philadelphia (A, B, C, D, E)
Easy-Mark, Inc., Lowell, Mass. (G)
Egyptian Lacquer Mfg. Co., Newark, N. J. (C)
Flint Ink Corp., Detroit (A, B, C, D, E, F, G)
•General Printing Ink Co., Div. Sun Chemical Corp., New York (A, B, C, D, E, G)
Gordon-Lacey Chemical Products Co., Maspeth, N. Y. (C)
Gotham Ink & Color Co., Long Island City, N. Y. (A, C)
Hill-Hentschel Co., St. Louis, Mo. (A, C, D, E, G)
Illinois Bronze Powder Co., Chicago (A, G)
•Interchemical Corp., Printing Ink Div., New York (A, B, C, D, E, G)
International Eastern Co., New York (D, G)
Lawter Chemicals, Inc., Chicago (B)
Levey, Fred'k. H., Co., New York (A, B, C, D, E, G)
•Markem Machine Co., Keene, N. H. (A, C, D, F, G)
Matthews, Jas. H., & Co., Pittsburgh (G)
McCutcheon Bros. & Quality, Inc., Philadelphia (B, D, E, F, G)
Pan Industrial Corp., New York (G)
Pannier Corp., Pittsburgh (A, G)
Pioneer Printing Ink Corp., Monroe, Mich. (A, D, E, G)
Polychrome Corp., Yonkers, N. Y. (B, D, E, G)
Pope & Gray, Inc., Clifton, N. J. (D, E, F)
Pyroxylin Products, Inc., Chicago (A, C, G)
Radiant Color Co., Oakland, Calif. (B)
Raffi & Swanson, Inc., Wilmington, Mass. (A, C)
Randall Duster Corp., Briarcliff Manor, N. Y. (F)
Roberts, Lewis, Inc., Newark, N. J. (A, D, E, F)
Schwartz Chemical Co., Long Island City, N. Y. (A, G)
Sinclair & Valentine Co., Printing Ink Div., American-Marietta Co., New York (A, B, C, D, E, F)
Sleight & Hellmuth Co., Chicago (A, C, D, E, F, G)
•Standard Packaging Corp., New York (A, B, C, D, E, F, G)
Sun Chemical Corp., New York (A, B, C, D, E, G)
•Switzer Brothers, Inc., Cleveland (B)
Time-Saving Specialties, Minneapolis (G)
Triangle Ink & Color Co., Bernardsville, N. J. (B, D, E, G)
Tubophane S.A., Paris, France (A, D)
Valley Printing Ink Corp., Green Bay, Wis. (D, E, G)
Varn Products Co., Flushing, N. Y. (F)
Weber Marking Systems, Inc., Mount Prospect, Ill. (G)
Wilson, W. D., Printing Ink Co., Long Island City, N. Y. (D, E, G)
Winton Engineering Co., Cincinnati (F)

LABELS, BANDS & CUT WRAPS, SPECIAL TYPES

(Plastics)

Editorial information, Div. IV Sec. 16

Andersen, A. J., Co., Chicago
•Auer, J. F., Inc., Mamaroneck, N. Y.
Bock, Frank, New York
Bristol Paper Products, Inc., Long Island City, N. Y.
•Cameo Die & Label Co., New York
Canada Foils, Ltd., Toronto, Ont.
Central Lithograph Co., Cleveland
•Chaspec Mfg. Co., Greenwich, Conn.
Consolidated Lithographing Corp., Carle Place, N. Y.
•Continental Can Co., Flexible Packaging Div., Mt. Vernon, Ohio
Cowan, Elton T., Co., New York
Crocker, H. S., Co., San Bruno, Calif.
•Dennison Mfg. Co., Framingham, Mass.
Diamond Printing & Label Corp., Philadelphia
Dixie Wax Paper Co., Dallas, Texas
Ever Ready Label Corp., Belleville, N. J.
Fairbairn Co., San Francisco
Fleming Potter Co., Peoria, Ill.
Foxon Co., Providence, R. I.
Gamse Lithographing Co., Baltimore, Md.
General Trade Mark Co., New York
Industrial Lithographic Co., Brooklyn, N. Y.
Kalamazoo Label Co., Kalamazoo, Mich.
Kendall Mfg. Co., Milwaukee
Lambooy Label & Wrapper Co., Kalamazoo, Mich.
Lustour Corp., St. Louis, Mo.
•Marathon, Div. American Can Co., Menasha, Wis.
•Milprint, Inc., Milwaukee
Milwaukee Label & Seal Co., Milwaukee
Muirson Label Co., San Jose, Calif.
•Nashua Corp., Nashua, N. H.
National Label Co., Philadelphia
Nevins Co., Clifton, N. J.
Nielsen Lithographing Co., Cincinnati
Normandie Press, Inc., New York
Oak Printing Co., Cleveland
Oberly & Newell, New York
•Oliver Machinery Co., Grand Rapids, Mich.
Package Products Co., Charlotte, N. C.
Packaging Pioneers, Inc., Tuckahoe, N. Y.
Packaging Products, Inc., Kansas City, Mo.
Packers Package, Inc., Muncie, Ind.
Pollock Paper Co., Div. St. Regis Paper Co., Dallas, Texas
Portland Label Co., Portland, Ore.
Rexford Paper Co., Milwaukee
Rochester Lithograph Mfg. Corp., Rochester, N. Y.
Rose Hill Lithographers, Inc., New York
Salem Label Co., Salem, Ohio
Spielman Co., Philadelphia
Tee-Pak, Inc., Chicago
•Tompkins' Label Service, Philadelphia
Topflight Corp., York, Pa.
Weil's, David, Sons Lithographic Co., Brooklyn, N. Y.
Wrapture, Inc., Flushing, N. Y.
Zuckerman, Joseph, Inc., Yonkers, N. Y.

LABELS & CUT WRAPS

A. *Embossed*
B. *Lithographed*
C. *Printed*
D. *Rotogravure*
E. *Silk Screened*
F. *Transparent*

Editorial information, Div. IV Sec. 16

Abt Lithographers, Inc., Branford, Conn. (B, C)
Ackermann, G. A., Printing Co., Cicero, Ill. (B, C)
Acme Tag Co., Minneapolis (C)
ADhere Corp., Cincinnati (C, E)
Albany Press Label Printers, Inc., Chicago (C)
•Allen Hollander Co., New York (A, C, F)
American Kleer-Vu Plastics, Inc., New York (F)
American Paper Box Co., Montreal, Que. (A, B, C)
•American Tag Co., Belleville, N. J. (A, C, D, F)
Andersen, A. J., Co., Chicago (A, C)
Arkadia Label Corp., New York (A)
Arkay Printing Co., New York (A, B, C)
Armor Box Corp., Newark, N. J. (B, C, D)
Attleboro Printing & Embossing Co., Attleboro, Mass. (A, C)
•Auer, J. F., Inc., Mamaroneck, N. Y. (A, D)
Autokraft Box Corp., York, Pa. (B)
Bagphane Corp., Flushing, N. Y. (C, F)
Bartlett Label Co., Kalamazoo, Mich. (A, C, F)
Bellen Co., Chicago (C, F)
Ben-Mont, The Dow Chemical Co., Dobeckmun Div., Bennington, Vt. (D)
Bock, Frank, New York (A, B, C, E)
•Bon-R Reproductions, Inc., New York (A, E)
Brandau Craig Dickerson Co., Nashville, Tenn. (B, C)
Braun, W., Co., Chicago (E)
Brett Lithographing Co., Long Island City, N. Y. (A, B, F)
Bristol Paper Products, Inc., Long Island City, N. Y. (C)

Bro-Dart Industries, Newark, N. J. (C)
Brooks & Porter, Inc., New York (A, B, C, D, E, F)
Cadillac Label Co., Kalamazoo, Mich. (A, C, F)
•Cameo Die & Label Co., New York (A, C, F)
Canada Foils, Ltd., Toronto, Ont. (A, C, D, F)
Champion Papers, Inc., Hamilton, Ohio (A, C, D)
•Chaspec Mfg. Co., Greenwich, Conn. (A, B, C, D, E)
Color Reproductions, Inc., Union, N. J. (E)
Consolidated Lithographing Corp., Carle Place, N. Y. (A, B, D)
•Continental Can Co., Flexible Packaging Div., Mt. Vernon, Ohio (A, C, D, F)
Cowan, Elton T., Co., New York (B, C)
Crocker, H. S., Co., San Bruno, Calif. (B, C)
Crystal Tube Corp., Chicago (C, F)
Daniels Mfg. Co., Rhinelander, Wis. (C, F)
Dekcraft Corp., Syosset, N. Y. (A, C, D)
Deline, I. A., Paper Boxes, Inc., Denver, Colo. (A, C)
•Dennison Mfg. Co., Framingham, Mass. (A, B, C, D, F)
Denver Plastics, Inc., Golden, Colo. (A, C)
Diamond Printing & Label Corp., Philadelphia (A, C, F)
Donnelley, R. R., & Sons Co., Chicago (B, C, D)
Emerson Labeltape & Supply Corp., Brooklyn, N. Y. (C, F)
Essex Paper Box Mfg. Co., Newark, N. J. (B, C)
Eureka Specialty Printing Co., Scranton, Pa. (B, C)
Ever Ready Label Corp., Belleville, N. J. (A, B, C, F)
Fairbairn Co., San Francisco (C)
Feder Industries, Inc., New York (E)
Fenton Label Co., Philadelphia (C)
Fleming Potter Co., Peoria, Ill. (A, B, C)
Flexible Tape & Label Co., Memphis, Tenn. (C)
Foilcraft Printing Corp., New York (A, B, C, E)
Foxon Co., Providence, R. I. (A, C)
Gabe-Bert Crafts, Inc., Yonkers, N. Y. (B, C)
Gamse Lithographing Co., Baltimore, Md. (A, B, D)
Gardner-Brooks, Inc., Sub. Diamond National Corp., Springfield, Mass. (B)
General Trade Mark Co., New York (A, C)
House of Harley, Inc., New York (A, B, C)
•Howell, F. M., & Co., Elmira, N. Y. (A, B, C)
Industrial Lithographic Co., Brooklyn, N. Y. (A, B, C)
Inland Lithograph Co., Chicago (B)
•Jackmeyer Corp., New York (B, C, D)
KVP Sutherland Paper Co., Kalamazoo, Mich. (B, C, D)
Kalamazoo Label Co., Kalamazoo, Mich. (C)
Kaumagraph Co., Wilmington, Del. (B, D)
Kehr Products Co., Willow Grove, Pa. (C, D, F)
Kleist & Co., Portland, Ore. (C)
Lambooy Label & Wrapper Co., Kalamazoo, Mich. (A, C, F)
Lawson & Jones Ltd., London, Ont. (A, B, C)
Leedpak, Inc., New York (A, B, C)
Linear Products, Inc., New York (C, F)
Lord Baltimore Press, Inc., New York (A, D)
Lustour Corp., St. Louis, Mo. (A, C, D)
Lutz & Sheinkman, New York (B)
•Marathon, Div. American Can Co., Menasha, Wis. (C, D)
Mason, F. E., & Sons, Batavia, N. Y. (A)
May, Alfred M., Co., Cincinnati (B, C)
Mead Papers, Inc., Sub. The Mead Corp., Dayton, Ohio (A)
Mendola Bros., Inc., New Orleans, La. (B, C)
Mid-York Press, Inc., Hamilton, N. Y. (C)
•Milprint, Inc., Milwaukee (A, B, D, F)
Milwaukee Label & Seal Co., Milwaukee (A, B, C)
•Monarch Marking System Co., Dayton, Ohio (C)
Morrill Press, Fulton, N. Y. (B, C, D)
Muirson Label Co., San Jose, Calif. (A, B, C, D)
Multi-Colortype Co., Cincinnati (C, D)
•Nashua Corp., Nashua, N. H. (A, C, D)
National Label Co., Philadelphia (C)
Nevins Co., Clifton, N. J. (C)
New York Label & Box Corp., New York (B, C)
Nielsen Lithographing Co., Cincinnati (B)
Normandie Press, Inc., New York (B, C, F)
Oak Printing Co., Cleveland (C)
Oberly & Newell, New York (B, C)
•Oliver Machinery Co., Grand Rapids, Mich. (D)
Orchard Paper Co., St. Louis, Mo. (C, D)
•Owens-Illinois Glass Co., Toledo, Ohio (B)
Package Products Co., Charlotte, N. C. (B, C, E)
Packaging Pioneers, Inc., Tuckahoe, N. Y. (A, C, F)
Packaging Products, Inc., Kansas City, Mo. (F)
Packers Package, Inc., Muncie, Ind. (B)
Paramount Paper Products Co., Omaha, Neb. (A, C, F)
Parrot Litho A/S, Copenhagen, Denmark (B)
Paterson Parchment Paper Co., Bristol, Pa. (B, C)
Penn Lithographing Co., Philadelphia (B)
Philipp Lithographing Co., Grafton, Wis. (B)
Phoenix Products Co., Milwaukee (C)
Piedmont Label Co., Bedford, Va. (B)
Pollock Paper Co., Div. St. Regis Paper Co., Dallas, Texas (D)
Portland Label Co., Portland, Ore. (C)
Progress Lithographing Co., Cincinnati (A, B)
Rap Industries, Inc., Minneapolis (A, C, D)
Rexford Paper Co., Milwaukee (C)
•Reynolds Metals Co., Richmond, Va. (D)
•Riegel Paper Corp., New York (A, B, C)
Robinson Tag & Label Co., New York (C, E)
Rochester Lithograph Mfg. Corp., Rochester, N. Y. (B, C)
Rollprint Products Corp., Chicago (A, B, C, D, F)
Rose Hill Lithographers, Inc., New York (B)
Rossotti Lithograph Corp., No. Bergen, N. J. (B)
Rothchild Printing Co., New York (B, C)
St. Louis Lithographing Co., St. Louis, Mo. (A, B)
St. Regis Paper Co., New York (B, C, D, F)
Salem Label Co., Salem, Ohio (B, C, D, F)
Schenker Co., Chicago (A, B, C, D, F)
Schmidt Lithograph Co., San Francisco (A, B, C)
Somerville Ltd., London, Ont. (B)
Spielman Co., Philadelphia (A, B, C, E)
•Standard Packaging Corp., New York (F)
•Standard Packaging Corp., Allegheny-Fuller Div., Pittsburgh (A, B, C, D)
Stecher-Traung Lithograph Corp., Rochester, N. Y. (A, B)
Strawberry Hill Press, Inc., Long Island City, N. Y. (C, D)
Tablet & Ticket Co., Chicago (A, C)
Talmadge Printing Co., New York (A)
•Tompkins' Label Service, Philadelphia (C, F)
Topflight Corp., York, Pa. (C, E, F)
Trautmann, Bailey & Blampey, New York (B)
Tripp Tape, Inc., Skokie, Ill. (B, C)
•United States Printing & Lithograph, Div. Diamond National Corp., New York (A, B, C, D)
Walle & Co., New Orleans, La. (B, C)
Weil's, David, Sons Lithographic Co., Brooklyn, N. Y. (A, B, C)
Wrapture, Inc., Flushing, N. Y. (C, F)
York Label Corp., York, Pa. (A, C, F)
Zuckerman, Joseph, Inc., Yonkers, N. Y. (B, C)

LABELS, DECALCOMANIA

Editorial information, Div. IV Sec. 16

•Allen Hollander Co., New York
American Tag Co., Belleville, N. J.
Anodyne, Inc., No. Miami Beach, Fla.
Attleboro Printing & Embossing Co., Attleboro, Mass.
Bagphane Corp., Flushing, N. Y.
Bartlett Label Co., Kalamazoo, Mich.
Brady, W. H., Co., Milwaukee
•Coated Products, Inc., Middlesex, N. J.
•Continental Can Co., Flexible Packaging Div., Mt. Vernon, Ohio
Dixie Wax Paper Co., Dallas, Texas
Lambooy Label & Wrapper Co., Kalamazoo, Mich.
Morse Decals, Los Angeles
Oberly & Newell, New York
Packaging Pioneers, Inc., Tuckahoe, N. Y.
Palm Bros. Decalcomania Co., Cincinnati
Rollprint Products Corp., Chicago
Schenker Co., Chicago
Spielman Co., Philadelphia
Topflight Corp., York, Pa.

LABELS, FOIL

A. Foil
B. Heavy Metal

Editorial information, Div. IV Sec. 16

Ackermann, G. A., Printing Co., Cicero, Ill. (A)
ADhere Corp., Cincinnati (A)
•Allen Hollander Corp., New York (A, B)
•American Tag Co., Belleville, N. J. (A)
Andersen, A. J., Co., Chicago (A)
Anodyne, Inc., No. Miami Beach, Fla. (A, B)
Arkadia Label Corp., New York (A)
Arkay Printing Co., New York (A)
Attleboro Printing & Embossing Co., Attleboro, Mass. (A, B)
Avery Label Co., Div. Avery Adhesive Products, Inc., Monrovia, Calif. (A)
Bagphane Corp., Flushing, N. Y. (A)
Bartlett Label Co., Kalamazoo, Mich. (A, B)
•Bon-R Reproductions, Inc., New York (A)
Brady, W. H., Co., Milwaukee (A, B)
Brett Lithographing Co., Long Island City, N. Y. (A)
Cadillac Label Co., Kalamazoo, Mich. (A, B)
•Cameo Die & Label Co., New York (A)
Canada Foils, Ltd., Toronto, Ont. (A)
Catty, H. D., Corp. of New York, Norwalk, Conn. (A)
•Chaspec Mfg. Co., Greenwich, Conn. (A)
Consolidated Lithographing Corp., Carle Place, N. Y. (A)
•Continental Can Co., Flexible Packaging Div., Mt. Vernon, Ohio (A)
Crocker, H. S., Co., San Bruno, Calif. (A)

Crown Zellerbach Corp., Western-Waxide Div., San Leandro, Calif. (A)
Crystal Tube Corp., Chicago (A)
Deline, I. A., Paper Boxes, Inc., Denver, Colo. (A)
Denney-Reyburn Co., W. Chester, Pa. (A)
•Dennison Mfg. Co., Framingham, Mass. (A)
Diamond Printing & Label Corp., Philadelphia (A, B)
Dickinson, John, & Co., Hemel Hempstead, Herts., England (A)
Dixie Wax Paper Co., Dallas, Texas (A)
Eureka Specialty Printing Co., Scranton, Pa. (A)
Ever Ready Label Corp., Belleville, N. J. (A, B)
Fleming Potter Co., Peoria, Ill. (A)
Foilcraft Printing Corp., New York (A, B)
Foxon Co., Providence, R. I. (A, B)
Gamse Lithographing Co., Baltimore, Md. (A)
General Trade Mark Co., New York (A)
House of Harley, Inc., New York (A)
Industrial Lithographic Co., Brooklyn, N. Y. (A)
•Jackmeyer Corp., New York (A)
Kaumagraph Co., Wilmington, Del. (A)
Kehr Products Co., Willow Grove, Pa. (A)
Koch Convertograph Co., Evansville, Ind. (A)
Lambooy Label & Wrapper Co., Kalamazoo, Mich. (A, B)
Lawson & Jones Ltd., London, Ont. (A)
Linear Products, Inc., New York (A)
Lord Baltimore Press, Inc., New York (A)
Lustour Corp., St. Louis, Mo. (A)
Mason, F. E., & Sons, Batavia, N. Y. (A, B)
May, Alfred M., Co., Cincinnati (A)
•Milprint, Inc., Milwaukee (A)
Milwaukee Label & Seal Co., Milwaukee (A)
Morrill Press, Fulton, N. Y. (A)
Muirson Label Co., San Jose, Calif. (A)
National Label Co., Philadelphia (A)
New York Label & Box Corp., New York (A)
Nielsen Lithographing Co., Cincinnati (A)
Normandie Press, Inc., New York (A)
Oberly & Newell, New York (A)
Orchard Paper Co., St. Louis, Mo. (A)
Package Products Co., Charlotte, N. C. (A)
Packaging Pioneers, Inc., Tuckahoe, N. Y. (A, B)
Paramount Paper Products Co., Omaha, Neb. (A)
Portland Label Co., Portland, Ore. (A)
Rap Industries, Inc., Minneapolis (A)
•Reynolds Metals Co., Richmond, Va. (A)
•Riegel Paper Corp., New York (A)
Robinson Tag & Label Co., New York (A)
Rollprint Products Corp., Chicago (A)
St. Louis Lithographing Co., St. Louis, Mo. (A)
St. Regis Paper Co., New York (A)
Salem Label Co., Salem, Ohio (A)
Schenker Co., Chicago (A)
Schmidt Lithograph Co., San Francisco (A)
Sillcocks Miller Co., Maplewood, N. J. (A)
Spielman Co., Philadelphia (A)
Stecher-Traung Lithograph Corp., Rochester, N. Y. (A)
Steigerwald, A. M., Co., Chicago (A)
Strawberry Hill Press, Inc., Long Island City, N. Y. (A)
Tablet & Ticket Co., Chicago (A)
Talmadge Printing Co., New York (A, B)
•Tompkins' Label Service, Philadelphia (A)
•United States Printing & Lithograph, Div. Diamond National Corp., New York (A)
Venesta Foils Ltd., London, England (A)
Western Foil Co. of Seattle, Seattle, Wash. (A, B)
Western Foil Converters, Inc., Berkeley, Calif. (A)
Wrapture, Inc., Flushing, N. Y. (A)

LABELS, PRESSURE-SENSITIVE

(Self-Adhesive)

Editorial information, Div. IV Sec. 16

Acme Tag Co., Minneapolis
ADhere Corp., Cincinnati
•Allen Hollander Co., New York
American "Pres-Stix" Tape Co., Detroit
•American Tag Co., Belleville, N. J.
Andersen, A. J., Co., Chicago
Anodyne, Inc., No. Miami Beach, Fla.
Arkadia Label Corp., New York
Attleboro Printing & Embossing Co., Attleboro, Mass.
•Auer, J. F., Inc., Mamaroneck, N. Y.
Avery Label Co., Div. Avery Adhesive Products, Inc., Monrovia, Calif.
Bagphane Corp., Flushing, N. Y.
Bartlett Label Co., Kalamazoo, Mich.
Bock, Frank, New York
•Bon-R Reproductions, Inc., New York
Brady, W. H., Co., Milwaukee
Brandau Craig Dickerson Co., Nashville, Tenn.
Brett Lithographing Co., Long Island City, N. Y.
Bro-Dart Industries, Newark, N. J.
Cadillac Label Co., Kalamazoo, Mich.
•Cameo Die & Label Co., New York
Canada Foils Ltd., Toronto, Ont.
•Chaspec Mfg. Co., Greenwich, Conn.
•Clamco Div., Cleveland-Detroit Corp., Cleveland
•Coated Products, Inc., Middlesex, N. J.
Crocker, H. S., Co., San Bruno, Calif.
Denney-Reyburn Co., W. Chester, Pa.
•Dennison Mfg. Co., Framingham, Mass.
Diamond Printing & Label Corp., Philadelphia
Dickinson, John, & Co., Hemel Hempstead, Herts., England
Emerson Labeltape & Supply Corp., Brooklyn, N. Y.
Eureka Specialty Printing Co., Scranton, Pa.
Ever Ready Label Corp., Belleville, N. J.
Fairbairn Co., San Francisco
Fasson Products, Div. Avery Adhesive Products, Inc., Painesville, Ohio
Fenton Label Co., Philadelphia
Fleming Potter Co., Peoria, Ill.
Flexible Tape & Label Co., Memphis, Tenn.
Foilcraft Printing Corp., New York
Fox, C. J., Co., Providence, R. I.
Foxon Co., Providence, R. I.
•Frank, Walter, Organization, Hillside, Ill.
General Trade Mark Co., New York
Gummed Tape & Devices Co., Brooklyn, N. Y.
•Howell, F. M., & Co., Elmira, N. Y.
Industrial Lithographic Co., Brooklyn, N. Y.
•Jackmeyer Corp., New York
Kalamazoo Label Co., Kalamazoo, Mich.
Kimball, A., Co., Brooklyn, N. Y.
Labelon Corp., Canandaigua, N. Y.
Lambooy Label & Wrapper Co., Kalamazoo, Mich.
Linear Products, Inc., New York
Mason, F. E., & Sons, Batavia, N. Y.
May, Alfred M., Co., Cincinnati
Melrose Packaging Corp., Flushing, N. Y.
Mendola Bros., Inc., New Orleans, La.
•Milprint, Inc., Milwaukee
Milwaukee Label & Seal Co., Milwaukee
•Monarch Marking System Co., Dayton, Ohio
National Label Co., Philadelphia
•National Tag Co., Dayton, Ohio
New York Label & Box Corp., New York
Nielsen Lithographing Co., Cincinnati
Normandie Press, Inc., New York
Oak Printing Co., Cleveland
Package Products Co., Charlotte, N. C.
Packaging Pioneers, Inc., Tuckahoe, N. Y.
Pannier Corp., Pittsburgh
Paramount Paper Products Co., Omaha, Neb.
Peerless Packages, Inc., Cleveland
Phoenix Products Co., Milwaukee
Portland Label Co., Portland, Ore.
Richmond Paper Co., Highland, Calif.
•Riegel Paper Corp., New York
Robinson Tag & Label Co., New York
Rochester Lithograph Mfg. Corp., Rochester, N. Y.
Rothchild Printing Co., New York
Salem Label Co., Salem, Ohio
Soabar Co., Philadelphia
Sohn Manufacturing, Inc., Elkhart Lake, Wis.
Spielman Co., Philadelphia
•Standard Packaging Corp., Allegheny-Fuller Div., Pittsburgh
Steigerwald, A. M., Co., Chicago
Tablet & Ticket Co., Chicago
Talmadge Printing Co., New York
Technical Tape Corp., New Rochelle, N. Y.
•Tompkins' Label Service, Philadelphia
Topflight Corp., York, Pa.
Transparent Products Co., New York
Tripp Tape, Inc., Skokie, Ill.
Twitchell, E. W., Inc., Packaging Div., Philadelphia
U. S. Tape Corp., St. Louis, Mo.
Weber Marking Systems, Inc., Mount Prospect, Ill.
Wrapture, Inc., Flushing, N. Y.
York Label Corp., York, Pa.
Zuckerman, Joseph, Inc., Yonkers, N. Y.

LABELS, ROLL TYPE

(For Shipping & Marking)

Editorial information, Div. IV Sec. 16

Acme Tag Co., Minneapolis
•Allen Hollander Co., New York
•American Tag Co., Belleville, N. J.
•Auer, J. F., Inc., Mamaroneck, N. Y.
Avery Label Co., Div. Avery Adhesive Products, Inc., Monrovia, Calif.
Bartlett Label Co., Kalamazoo, Mich.
Bock, Frank, New York
Brady, W. H., Co., Milwaukee
Cadillac Label Co., Kalamazoo, Mich.
Crocker, H. S., Co., San Bruno, Calif.
Denney-Reyburn Co., W. Chester, Pa.
•Dennison Mfg. Co., Framingham, Mass.
Diamond Printing & Label Corp., Philadelphia
Dura-Lee Corp., Kansas City, Kan.
Eureka Specialty Printing Co., Scranton, Pa.
Ever Ready Label Corp., Belleville, N. J.
Fairbairn Co., San Francisco
Fenton Label Co., Philadelphia
Fleming Potter Co., Peoria, Ill.
General Trade Mark Co., New York
Kimball, A., Co., Brooklyn, N. Y.
Lambooy Label & Wrapper Co., Kalamazoo, Mich.
•Monarch Marking System Co., Dayton, Ohio
•Nashua Corp., Nashua, N. H.
Normandie Press, Inc., New York
•Oliver Machinery Co., Grand Rapids, Mich.
Package Products Co., Charlotte, N. C.
Packaging Pioneers, Inc., Tuckahoe, N. Y.

Addresses of companies listed appear on pp. 808-847

Paramount Paper Products Co., Omaha, Neb.
Peerless Packages, Inc., Cleveland
Richmond Paper Co., Highland, Calif.
Robinson Tag & Label Co., New York
Rose Hill Lithographers, Inc., New York
St. Regis Paper Co., New York
Salem Label Co., Salem, Ohio
Soabar Co., Philadelphia
Sohn Manufacturing, Inc., Elkhart Lake, Wis.
•Standard Packaging Corp., Allegheny-Fuller Div., Pittsburgh
Steigerwald, A. M., Co., Chicago
•Tompkins' Label Service, Philadelphia
Topflight Corp., York, Pa.
U. S. Tape Corp., St. Louis, Mo.

LABELS, SHIPPING

Editorial information, Div. IV Sec. 16

Ackermann, G. A., Printing Co., Cicero, Ill.
Acme Tag Co., Minneapolis
•Allen Hollander Co., New York
•American Tag Co., Belleville, N. J.
Andersen, A. J., Co., Chicago
Avery Label Co., Div. Avery Adhesive Products, Inc., Monrovia, Calif.
Bartlett Label Co., Kalamazoo, Mich.
Bock, Frank, New York
Cambridge Paper Box Co., Cambridge, Mass.
Crocker, H. S., Co., San Bruno, Calif.
Denney-Reyburn Co., W. Chester, Pa.
•Dennison Mfg. Co., Framingham, Mass.
Dickinson, John, & Co., Hemel Hempstead, Herts., England
Dura-Lee Corp., Kansas City, Kan.
Eureka Specialty Printing Co., Scranton, Pa.
Ever Ready Label Corp., Belleville, N. J.
Fairbairn Co., San Francisco
Fenton Label Co., Philadelphia
Fleming Potter Co., Peoria, Ill.
General Trade Mark Co., New York
Kalamazoo Label Co., Kalamazoo, Mich.
Kimball, A., Co., Brooklyn, N. Y.
Lambooy Label & Wrapper Co., Kalamazoo, Mich.
Milwaukee Label & Seal Co., Milwaukee
National Label Co., Philadelphia
New York Label & Box Corp., New York
Normandie Press, Inc., New York
Package Products Co., Charlotte, N. C.
Packaging Pioneers, Inc., Tuckahoe, N. Y.
Paramount Paper Products Co., Omaha, Neb.
Portland Label Co., Portland, Ore.
Richmond Paper Co., Highland, Calif.
Robinson Tag & Label Co., New York
Rochester Lithograph Mfg. Corp., Rochester, N. Y.
Salem Label Co., Salem, Ohio
Soabar Co., Philadelphia
Sohn Manufacturing, Inc., Elkhart Lake, Wis.
Spielman Co., Philadelphia
•Standard Packaging Corp., Allegheny-Fuller Div., Pittsburgh
Steigerwald, A. M., Co., Chicago
Tablet & Ticket Co., Chicago
Talmadge Printing Co., New York
•Tompkins' Label Service, Philadelphia
Topflight Corp., York, Pa.
Weber Marking Systems, Inc., Mount Prospect, Ill.
Zuckerman, Joseph, Inc., Yonkers, N. Y.

LABELS, STOCK

Editorial information, Div. IV Sec. 16

Albany Press Label Printers, Inc., Chicago
•Allen Hollander Co., New York
Avery Label Co., Div. Avery Adhesive Products, Inc., Monrovia, Calif.
Bartlett Label Co., Kalamazoo, Mich.
Brandau Craig Dickerson Co., Nashville, Tenn.
Cambridge Paper Box Co., Cambridge, Mass.
•Cameo Die & Label Co., New York
Crocker, Burbank Papers, Inc., Fitchburg, Mass.
Crocker, H. S., Co., San Bruno, Calif.
Denney-Reyburn Co., W. Chester, Pa.
•Dennison Mfg. Co., Framingham, Mass.
Dickinson, John, & Co., Hemel Hempstead, Herts., England
Eureka Specialty Printing Co., Scranton, Pa.
Ever Ready Label Corp., Belleville, N. J.
Fenton Label Co., Philadelphia
General Trade Mark Co., New York
Kimball, A., Co., Brooklyn, N. Y.
Lambooy Label & Wrapper Co., Kalamazoo, Mich.
Mead Papers, Inc., Sub. The Mead Corp., Dayton, Ohio
Mendola Bros., Inc., New Orleans, La.
Milwaukee Label & Seal Co., Milwaukee
•Nashua Corp., Nashua, N. H.
•National Tag Co., Dayton, Ohio
Normandie Press, Inc., New York
Paramount Paper Products Co., Omaha, Neb.
Parrot Litho A/S, Copenhagen, Denmark
Portland Label Co., Portland, Ore.
Richmond Paper Co., Highland, Calif.
Salem Label Co., Salem, Ohio
Soabar Co., Philadelphia
Spielman Co., Philadelphia
•Standard Packaging Corp., Allegheny-Fuller Div., Pittsburgh
Talmadge Printing Co., New York
Technical Tape Corp., New Rochelle, N. Y.
•Tompkins' Label Service, Philadelphia

LABELS, VACUUM-METALLIZED PAPER

Editorial information, Div. IV Sec. 16

ADhere Corp., Cincinnati
Avery Label Co., Div. Avery Adhesive Products, Inc., Monrovia, Calif.
Bartlett Label Co., Kalamazoo, Mich.
Brady, W. H., Co., Milwaukee
Consolidated Lithographing Corp., Carle Place, N. Y.
•Continental Can Co., Flexible Packaging Div., Mt. Vernon, Ohio
Diamond Printing & Label Corp., Philadelphia
Dixie Wax Paper Co., Dallas, Texas
Ever Ready Label Corp., Belleville, N. J.
Fleming Potter Co., Peoria, Ill.
Foxon Co., Providence, R. I.
General Trade Mark Co., New York
Kehr Products Co., Willow Grove, Pa.
Lambooy Label & Wrapper Co., Kalamazoo, Mich.
•Milprint, Inc., Milwaukee
Nielsen Lithographing Co., Cincinnati
Oak Printing Co., Cleveland
Orchard Paper Co., St. Louis, Mo.
Rollprint Products Corp., Chicago
Schenker Co., Chicago
Sillcocks Miller Co., Maplewood, N. J
•Standard Packaging Corp., New York
•Tompkins' Label Service, Philadelphia

LABELS, WATER-RESISTANT

Editorial information, Div. IV Sec. 16

Ackermann, G. A., Printing Co., Cicero, Ill.
ADhere Corp., Cincinnati
•American Tag Co., Belleville, N. J.
•Auer, J. F., Inc., Mamaroneck, N. Y.
Avery Label Co., Div. Avery Adhesive Products, Inc., Monrovia, Calif.
Bartlett Label Co., Kalamazoo, Mich.
Brady, W. H., Co., Milwaukee
•Cameo Die & Label Co., New York
Consolidated Lithographing Corp., Carle Place, N. Y.
Denney-Reyburn Co., W. Chester, Pa.
•Dennison Mfg. Co., Framingham, Mass.
Diamond Printing & Label Corp., Philadelphia
Dixie Wax Paper Co., Dallas, Texas
Ever Ready Label Corp., Belleville, N. J.
Fleming Potter Co., Peoria, Ill.
Flexible Tape & Label Co., Memphis, Tenn.
House of Harley, Inc., New York
Kalamazoo Label Co., Kalamazoo, Mich.
Kimball, A., Co., Brooklyn, N. Y.
Lambooy Label & Wrapper Co., Kalamazoo, Mich.
Linear Products, Inc., New York
National Label Co., Philadelphia
Oak Printing Co., Cleveland
Rothchild Printing Co., New York
St. Louis Lithographing Co., St. Louis, Mo.
Salem Label Co., Salem, Ohio
Sillcocks Miller Co., Maplewood, N. J.
Steigerwald, A. M., Co., Chicago
•Tompkins' Label Service, Philadelphia
Topflight Corp., York, Pa.
Weil's, David, Sons Lithographic Co., Brooklyn, N. Y.
Zuckerman, Joseph, Inc., Yonkers, N. Y.

LACQUERS & VARNISHES

(See Coatings, Protective)

LAMINATING COMPOUNDS

Editorial information, Div. I Sec. 4, 5

•Adcote Chemicals, Inc., Elk Grove, Ill.
Adhesive Products Corp., New York
•Boler Petroleum Co., Ardmore, Pa.
Borden Chemical Co., New York
•du Pont de Nemours, E. I., & Co., Wilmington, Del.
Gordon-Lacey Chemical Products Co., Maspeth, N. Y.
Harco Industries, Inc., Rochester, N. Y.
Hermetite Corp., Carlstadt, N. J.
Imperial Adhesives, Cincinnati
Marblette Corp., Long Island City, N. Y.
Monsanto Chemical Co., St. Louis, Mo.
•Morningstar-Paisley, Inc., New York
National Starch & Chemical Corp., New York
National Starch & Chemical Co. (Canada), Toronto, Ont.
Noble, M. J., Co., San Francisco
Pennsylvania Industrial Chemical Corp., Clairton, Pa.
Philadelphia Quartz Co., Philadelphia
Pierce & Stevens Chemical Corp., Buffalo, N. Y.
Polymer Industries, Inc., Springdale, Conn.
Pyroxylin Products, Inc., Chicago
Research Sales, Inc., Suffern, N. Y.
Roma Adhesives, Inc., E. Newark, N. J.
Schwartz Chemical Co., Long Island City, N. Y.
Socony Mobil Oil Co., New York
Sonneborn Chemical & Refining Corp., New York
Southern Adhesives Corp., Richmond, Va.
Terrell Corp., Wilmington, Mass.
Testworth Laboratories, Inc., Addison, Ill.
Union Carbide Corp., Silicones Div., New York
•Union Paste Co., Boston
Virginia Chemical Corp., Lynchburg, Va.

LATEX

(Rubber or Resin Dispersions)

Editorial information, Div. I Sec. 3, 5

Adhesive Products Corp., New York
Air Reduction Chemical & Carbide Co., Div. Air Reduction Co., New York
American Adhesive Mfg. Co., Brooklyn, N. Y.
Atwood Adhesives, Inc., Seattle, Wash.
Borden Chemical Co., New York
California Ink Co., San Francisco
Dewey & Almy Chemical Div., W. R. Grace & Co., Cambridge, Mass.
•Dow Chemical Co., Midland, Mich.
•du Pont de Nemours, E. I., & Co., Wilmington, Del.
Firestone Plastics Co., Div. Firestone Tire & Rubber Co., Pottstown, Pa.
General Latex & Chemical Corp., Cambridge, Mass.
Goodrich, B. F., Chemical Co., Cleveland
Goodyear Tire & Rubber Co., Chemical Div., Akron, Ohio
Imperial Adhesives, Cincinnati
Imperial Chemical Industries Ltd., London, England
•Koppers Co., Pittsburgh
•Morningstar-Paisley, Inc., New York
National Starch & Chemical Corp., New York
National Starch & Chemical Co. (Canada), Toronto, Ont.
Pennsylvania Industrial Chemical Corp., Clairton, Pa.
Pyroxylin Products, Inc., Chicago
Research Sales, Inc., Suffern, N. Y.
Testworth Laboratories, Inc., Addison, Ill.
Union Carbide Chemicals Co., New York
United States Rubber Co., Naugatuck Chemical Div., Naugatuck, Conn.
Virginia Chemical Corp., Lynchburg, Va.

LEATHER & LEATHERETTE

Editorial information, Div. IV Sec. 15

Farrington Texol Corp., Walpole, Mass.
Fasson Products, Div. Avery Adhesive Products, Inc., Painesville, Ohio
Kupfer Bros. Co., New York
Marvellum Co., Holyoke, Mass.
Textileather Div., General Tire & Rubber Co., Toledo, Ohio

LINERS, BAG, BARREL, BOX, CASE & DRUM

Editorial information, Div. V Sec. 17

Albemarle Paper Mfg. Co., Richmond, Va.
Arkell Safety Bag Co., New York
Associated Bag & Apron Co., Chicago
Bemis Bro. Bag Co., St. Louis, Mo.
Better Containers Mfg. Co., Chicago
Blossom Mfg. Co., Brooklyn, N. Y.
Boyertown Packaging Service Corp., Boyertown, Pa.
Bradford, W. J., Paper Co., Chicago
COSECO, Los Angeles
Cadillac Products, Inc., Warren, Mich.
Canton Containers, Inc., Canton, Ohio
Cello Bag Co., Seattle, Wash.
Cello-Pack, Inc., Buffalo, N. Y.
•Cellu-Craft Products Corp., New Hyde Park, N. Y.
Central States Paper & Bag Co., St. Louis, Mo.
Central Waxed Paper Co., Div. St. Regis Paper Co., Chicago
Chase Bag Co., New York
Cincinnati Industries, Inc., Cincinnati
Constantine Paperboard Div., The Davey Co., Constantine, Mich.
•Continental Can Co., Flexible Packaging Div., Mt. Vernon, Ohio
•Cromwell Paper Co., Chicago
Crystal-X Corp., Lenni Mills, Pa.
Delaware Barrel & Drum Co., Wilmington, Del.
Diaphane Corp., Philadelphia
Dixie Wax Paper Co., Dallas, Texas
Dura-Lee Corp., Kansas City, Kan.
Eclipse Plastic Industries, Inc., Sarasota, Fla.
Equitable Paper Bag Co., Long Island City, N. Y.
Excelsior Transparent Bag Mfg. Co., Yonkers, N. Y.
•Fibreboard Paper Products Corp., San Francisco
General Films, Inc., Covington, Ohio
Gering Plastics, Kenilworth, N. J.
Gilman Paper Co., New York
Glenfab Bag & Liner Co., Glens Falls, N. Y.
Grand Bag & Paper Co., Hi-Land Paper Products Div., Mt. Vernon, N. Y.
H & R Plastics Industries, Inc., Nazareth, Pa.
Haveg Industries, Inc., Blow-Molding Div., Bound Brook, N. J.
•Hedwin Corp., New York
Holland Insulated Wire & Cable Works Ltd., Amsterdam, Holland
House of More, San Francisco
KVP Sutherland Paper Co., Kalamazoo, Mich.
Kehr Products Co., Willow Grove, Pa.
Kendall Mfg. Co., Milwaukee
Kennedy Car Liner & Bag Co., Shelbyville, Ind.
Keystone Packaging Service, Inc., Phillipsburg, N. J.
Kleerpak Mfg. Co., No. Hollywood, Calif.
•Kobi Polyethylene Bag Mfg. Co., Brooklyn, N. Y.
•Kordite Co., Div. National Distillers & Chemical Corp., Macedon, N. Y.
Kuss, R. L., & Co., Findlay, Ohio
Leewood Corp., Lowell, Mass.
Lion Packaging Products Co., Hicksville, N. Y.
Lucas Sales Co., Oklahoma City, Okla.
•Ludlow Corp., Needham Heights, Mass.
M & D Flexographic Printers, Inc., Chicago
Magid-Robinson Co., New York
Mason Transparent Package Co., Div. Mason Envelope Co., New York
Master Packaging, Inc., Tampa, Fla.
Mead Board Sales, Inc., Cincinnati
•Mehl Mfg. Co., Cincinnati
•Milprint, Inc., Milwaukee
Modern Transparent Mfg. Co., W. Pittston, Pa.
New Jersey Transparent Co., Brooklyn, N. Y.
New York Packaging Corp., Brooklyn, N. Y.
Packageers Co., Chicago
Packaging Pioneers, Inc., Tuckahoe, N. Y.
Peerless Packages, Inc., Cleveland
Pexco Bag Mfg. Co., Toledo, Ohio
•Plastic Packaging Co., Chicago
•Plaxall, Inc., Long Island City, N. Y.
Protective Coatings Corp., Clifton, N. J.
•Protective Lining Corp., Brooklyn, N. Y.
•Queen Transparent Specialties Co., Chicago
Reliance Plastic & Chemical Corp., Paterson, N. J.
Richmond Paper Co., Highland, Calif.
•Riegel Paper Corp., New York
St. Regis Paper Co., New York
Sealcraft Products Corp., Milwaukee
Sherman Paper Products Co., Div. St. Regis Paper Co., Newton Upper Falls, Mass.
Shore Line Industries, Inc., Clinton, Conn.
Southern Special Products, Richmond, Va.
Speedmaster Packaging Corp., New York
•Standard Packaging Corp., Shelly Div., Farmington, Minn.
Swartz Mfg. Co., Dorchester, Mass.
Sweetnam, George H., Inc., Cambridge, Mass.
Texas Plastics, Inc., Elsa, Texas
•Thilmany Pulp & Paper Co., Kaukauna, Wis.
Tower Packaging Co., Wheeling, Ill.
Transparent Bag Co., Seattle, Wash.
VanPak Products, Inc., Tomah, Wis.
W. E. W. Container Co., Brooklyn, N. Y.
Webster Industries, Inc., Salem, Mass.
•West Virginia Pulp & Paper Co., New York
Weyerhaeuser Co., Wood Products Div., Tacoma, Wash.
Wrapture, Inc., Flushing, N. Y.

LINERS, CLOSURE

(See Closure Liners)

MARKING TYPE

(Brass, Rubber, Steel)

Editorial information, Div. III Sec. 13, Div. IV Sec. 15

•Ackerman Gould Co., Oceanside, N. Y.
Acro Tool & Die Works, Chicago
Admiral Coated Products, Inc., Hackensack, N. J.
•Apex Machine Co., College Point, N. Y.
Banner Marking Devices Co., Chicago
•Bell-Mark Corp., Bloomfield, N. J.
•Colton, Arthur, Co., Detroit
Cozzone Marking Co., Newark, N. J.
Force, Wm. A., & Co., Brooklyn, N. Y.
•Gottscho, Adolph, Inc., Hillside, N. J.
•Industrial Marking Equipment Co., Brooklyn, N. Y.
International Eastern Co., New York
•Kensol-Olsenmark, Inc., New York
Kimball, A., Co., Brooklyn, N. Y.
Kiwi Coders Corp., Chicago
•Markem Machine Co., Keene, N. H.
Matthews, Jas. H., & Co., Pittsburgh
Melind, Louis, Co., Chicago
Muskegon Marking Equipment Co., Packaging Supplies Div., Muskegon, Mich.
Pannier Corp., Pittsburgh
•Peerless Roll Leaf Co., Div. Howe Sound Co., Union City, N. J.
Pierce Wrapping Machine Co., La Grange Park, Ill.
Pryor Marking Products, Chicago
Superior Marking Equipment Co., Chicago
•United Shoe Machinery Corp., Boston
Weber Marking Systems, Inc., Mount Prospect, Ill.

METAL PIGMENTS

(Aluminum & Gold Bronze Powders)

•Aluminum Co. of America, Pittsburgh
Atlantic Powdered Metals, Inc., New York
Illinois Bronze Powder Co., Chicago
Metals Disintegrating Co., Div. American-Marietta Co., Elizabeth, N. J.

OPENING TAPE, CELLOPHANE & PLASTICS

Editorial information, Div. II Sec. 7

•Dobeckmun Co., Div. Dow Chemical Co., Cleveland
•Standard Packaging Corp., General Felt Products Div., Brooklyn, N. Y.
Walsello Products, Inc., Paterson, N. J.

PACKAGE DECORATIONS

A. Bows, Pre-Tied
B. Flowers, Artificial

Editorial information, Div. IV Sec. 15

Arbetter Ribbon & Mfg. Co., Chicago (A, B)
Artistic Flower Co., New York (A)
Artistic Mfg. Co., Div. Sun Chemical Co., Stamford, Conn. (A)
Ben-Mont, The Dow Chemical Co., Dobeckmun Div., Bennington, Vt. (A)
Buser, Inc., Paterson, N. J. (A)
Cardinal Flower & Novelty Co., New York (B)
Central States Paper & Bag Co., St. Louis, Mo. (A)
Chicago Printed String Co., Chicago (A)
Dekcraft Corp., Syosset, N. Y. (A)
Feder Industries, Inc., New York (A)
Goodbar Mfg. Co., Div. Hargood Ribbon Co., New York (A, B)
Maharam Fabric Corp., New York (B)
Minnesota Mining & Mfg. Co., St. Paul, Minn. (A)
Nesbit Industries, Inc., Chicago (B)
Rainbow Ribbons & Fabrics, Inc., New York (A)
Rosebud Mfg. Corp., New York (A)
Shear-Prinz Associates, Chicago (A, B)
Specialized Packaging Engineering Co., Phoenix, Ariz. (A)
Wachusett Converters, Inc., Leominster, Mass. (A)

PADDING & WADDING

(See Cushioning Materials)

PALLETS

A. Metal
B. Paper or Fibre-Board
C. Wood

Editorial information, Div. V Sec. 17

Acme Pallet Co., New York (A, C)
Allen & Hull, Inc., Rochester, N. H. (C)
American Box Corp., San Francisco (C)
•Animal Trap Co. of America, Lititz, Pa. (B)
Atlas General Industries, Inc., New York (C)
Atlas Pallet & Lumber Sales, Inc., Chicago (C)
Bell, Edwin, Cooperage Co., Pittsburgh, (B)
Bell Fibre Products Corp., Marion, Ind. (C)
Bigelow-Garvey Lumber Co., Chicago (C)
Binghamton Container Co., Binghamton, N. Y. (B)
Canton Containers, Inc., Canton, Ohio (C)
Carroll Box & Pallet Co., Los Angeles (C)
Chicago Mill & Lumber Co., Chicago (C)
Clinch-Tite Corp., Ardmore, Pa. (C)
Container Corp. of America, Chicago (B)
Cumberland Box Co., Cumberland, Md. (C)
Davidson, D. H., Mfg. Co., Philadelphia (C)
Dreyer, H. D., Box Co., Baltimore, Md. (C)
Dunning, J. H., Corp., Darien, Conn. (B, C)
Excelsior Plimptruck Co., Stamford, Conn. (C)
Factory Service Co., Milwaukee (A, C)
•Fibreboard Paper Products Corp., San Francisco (B)
Fichte Pallet Co., Floral Park, N. Y. (C)
Gardiner Paper Mills, Inc., Gardiner, Maine (B)
General Box Co., Des Plaines, Ill. (C)
Hines Pallet & Reel Co., Mt. Airy, N. C. (C)
Hitt, H. R., Lumber Co., Tunkhannock, Pa. (C)
•Hoerner Boxes, Inc., Keokuk, Iowa (B)
Kankakee Container Co., Kankakee, Ill. (B)
Lea, David M., & Co., Richmond, Va. (C)
Letts Box & Mfg. Co., St. Joseph, Mo. (C)
Main Brothers Box & Lumber Co., Karnak, Ill. (C)
Marathon Box Co., Wausau, Wis. (C)
Marinette & Menominee Box Co., Marinette, Wis. (C)
Mead Board Sales, Inc., Cincinnati (B)
Mead Papers, Inc., Sub. The Mead Corp., Dayton, Ohio (C)
Moraine Box Co., Dayton, Ohio (B, C)
National Pallet Corp., Pittsburgh (C)
Oakwood Products Co., Narragansett, R. I. (C)
Packaging & Converting Co., Washington, D. C. (B, C)
•Packaging Corp. of America, Evanston, Ill. (B)
Packing Material Co., Detroit (B, C)
Pein Box & Lumber Co., Portland, Ore. (C)
Portland Box Co., Portland, Maine (C)
Potlatch Forests, Inc., Lewiston, Idaho (C)
Rebo Mfg. Co., Newark, N. J. (A, C)
Republic Steel Corp., Cleveland (A)
River Raisin Paper Co., Div. Union Bag-Camp Paper Corp., Monroe, Mich. (B)
Sheldon Wood Products, Toano, Va. (C)
Signode Steel Strapping Co., Chicago (B)
Smeed Box Co., Cleveland (C)
Southern Special Products, Richmond, Va. (B)
Specialized Packaging Engineering Co., Phoenix, Ariz. (C)
Spring Wood Products, Inc., Geneva, Ohio (C)
Tier-Rack Corp., St. Louis, Mo. (C)
Townson, W. D., Lumber Co., Murphy, N. C. (A, C)
Treen Box Co., Philadelphia (C)
Union Steel Products Co., Albion, Mich. (A)
United Container Co., Philadelphia (C)
Vanant Co., Milwaukee (B)
Wabash Fibre Box Co., Div. The Weston Paper & Mfg. Co., Terre Haute, Ind. (B)
Williamsburg Millwork Corp., Bowling Green, Va. (C)
Woodstock Mfg. Co., Charleston, S. C. (C)
Yankie Lumber Co., Harriman, Tenn. (C)
Yardley Box Co., Chicago (C)

PAPER, ALKALI-PROOF

Editorial information, Div. I Sec. 3

Albemarle Paper Mfg. Co., Richmond, Va.
Champion Papers, Inc., Hamilton, Ohio
Crocker, Burbank Papers, Inc., Fitchburg, Mass.
Crown Zellerbach Corp., Industrial Paper Sales Div., San Francisco
•Crystal Tissue Co., Middletown, Ohio
KVP Sutherland Paper Co., Kalamazoo, Mich.
Kupfer Bros. Co., New York
Mead Papers, Inc., Sub. The Mead Corp., Dayton, Ohio
Oxford Paper Co., New York
Smith, Howard, Paper Mills Ltd., Montreal, Que.
Standard Insulation Co., E. Rutherford, N. J.
•Standard Packaging Corp., General Felt Products Div., Brooklyn, N. Y.
•Thilmany Pulp & Paper Co., Kaukauna, Wis.
•West Virginia Pulp & Paper Co., New York
•Westfield River Paper Co., Russell, Mass.

PAPER, ANTI-TARNISH

Editorial information, Div. I Sec. 3

Albemarle Paper Mfg. Co., Richmond, Va.
Ben-Mont, The Dow Chemical Co., Dobeckmun Div., Bennington, Vt.
Crocker, Burbank Papers, Inc., Fitchburg, Mass.
•Cromwell Paper Co., Chicago
Crown Zellerbach Corp., Industrial Paper Sales Div., San Francisco
•Crystal Tissue Co., Middletown, Ohio
Daubert Chemical Co., Chicago
•Dennison Mfg. Co., Framingham, Mass.
Dexter, C. H., & Sons, Inc., Windsor Locks, Conn.
Farrington Texol Corp., Walpole, Mass.
Gilman Paper Co., New York
KVP Sutherland Paper Co., Kalamazoo, Mich.
Kupfer Bros. Co., New York
Mead Papers, Inc., Sub. The Mead Corp., Dayton, Ohio
Narragansett Coated Paper Corp., Pawtucket, R. I.
Orchard Paper Co., St. Louis, Mo.
Oxford Paper Co., New York
Paterson Parchment Paper Co., Bristol, Pa.
Port Huron Sulphite & Paper Co., Port Huron, Mich.
•Riegel Paper Corp., New York
Shawano Paper Mills, Shawano, Wis.
Sherman Paper Products Co., Div. St. Regis Paper Co., Newton Upper Falls, Mass.
•Standard Packaging Corp., General Felt Products Div., Brooklyn, N. Y.
Strange, John, Paper Co., Menasha, Wis.
•Thilmany Pulp & Paper Co., Kaukauna, Wis.
Twitchell, E. W., Inc., Packaging Div., Philadelphia
VanPak Products, Inc., Tomah, Wis.
•Westfield River Paper Co., Russell, Mass.

PAPER, BOX COVERS

(See Paper, Fancy Printed or Embossed)

PAPER, COATED, DECORATIVE

A. Casein-Coated
B. Mat- or Antique-Coated
C. Metallic-Coated (Plain & Embossed)
D. Mica-Coated
E. Plastic-Coated
F. Varnish-Coated

Editorial information, Div. I Sec. 3, Div. IV Sec. 15

Albemarle Paper Mfg. Co., Richmond, Va. (A)
Appleton Coated Paper Co., Appleton, Wis. (A, B, C, D)
Artcote Papers, Inc., Irvington, N. J. (C)
Artistic Mfg. Co., Div. Sun Chemical Corp., Stamford, Conn. (C)
•Auer, J. F., Inc., Mamaroneck, N. Y. (B, C, E, F)
Bellen Co., Chicago (C, F)

Ben-Mont, The Dow Chemical Co., Dobeckmun Div., Bennington, Vt. (C, E)
Bristol Paper Products, Inc., Long Island City, N. Y. (C, E)
Canada Glazed Papers Ltd., Scarborough, Ont. (A, B, C, D, E, F)
•Cellu-Craft Products Corp., New Hyde Park, N. Y. (E)
Champion Papers, Inc., Hamilton, Ohio (A, E)
•Coated Products, Inc., Middlesex, N. J. (A, C, E)
Crocker, Burbank Papers, Inc., Fitchburg, Mass. (A, E)
Dejonge, Louis, & Co., New York (A, B, C, D, F)
Dekcraft Corp., Syosset, N. Y. (C)
•Dennison Mfg. Co., Framingham, Mass. (C)
Emerson Labeltape & Supply Corp., Brooklyn, N. Y. (E)
Facile Corp., Sub. Sun Chemical Corp., Paterson, N. J. (E)
Farrington Texol Corp., Walpole, Mass. (C, E)
Fisher's Foils Ltd., Wembley, Middx., England (C)
Formed Container Corp., Sub. Phillips Petroleum Co., Orangeburg, N. Y. (E)
Hampden Glazed Paper & Card Co., Holyoke, Mass. (A, B, C, D, E, F)
Hazen Paper Co., Holyoke, Mass. (B, C, D, E)
Kupfer Bros. Co., New York (A, B, C, D, E, F)
•Lachman-Novasel-Owens Paper Corp., New York (A, B, C, D, E, F)
•Ludlow Corp., Needham Heights, Mass. (A, C, E)
Marvellum Co., Holyoke, Mass. (A, B, C, D, E, F)
Mead Papers, Inc., Sub. The Mead Corp., Dayton, Ohio (A, E)
Miami Valley Coated Paper Co., Franklin, Ohio (A, B, C, D, E)
Modern Packaging, Inc., Mt. Holly, N. J. (E)
Narragansett Coated Paper Corp., Pawtucket, R. I. (A, B, C, D, E, F)
•Nashua Corp., Nashua, N. H. (A)
New England Card & Paper Co., Springfield, Mass. (A, B, C, D)
Orchard Paper Co., St. Louis, Mo. (A, B, C, E, F)
Oxford Paper Co., New York (A, B)
Papercraft Corp., Pittsburgh (B, C, F)
Pyrotex Co., Leominster, Mass. (E)
Raisin, John T., Corp., San Francisco (C, E)
•Riegel Paper Corp., New York (E)
Royal Paper Corp., New York (A, C)
Shopsin Paper Co., New York (A, B, C, D, E, F)
Smith, Howard, Paper Mills Ltd., Montreal, Que. (A)
Solatech Coating Corp., New Rochelle, N. Y. (E, F)
Southern Special Products, Richmond, Va. (C, F)
•Standard Packaging Corp., New York (C)
•Standard Packaging Corp., General Felt Products Div., Brooklyn, N. Y. (A, B, E, F)
•Thilmany Pulp & Paper Co., Kaukauna, Wis. (A, C, E, F)
Unger Laminating Co., Brooklyn, N. Y. (C)
Union Bag-Camp Paper Corp., New York (A, E)
Wachusett Converters, Inc., Leominster, Mass. (B, C)
•Warren, S. D., Co., Boston (A, C)
•West Virginia Pulp & Paper Co., New York (A, B)
Western Foil Converters, Inc., Berkeley, Calif., (C. E)
Wyomissing Paper Products, Reading, Pa. (A, B, C, D)

PAPER, COATED, PROTECTIVE

A. Hot Melts
B. Lacquers
C. Nylon
D. Polyethylene
E. Resinous

Editorial information, Div. I Sec. 3, Div. V Sec. 17

•Acme Backing Corp., Stamford, Conn. (B, D, E)
Adhesive Tape Corp., Brooklyn, N. Y. (E)
American Sisalkraft Corp., Attleboro, Mass. (D)
Arkell Safety Bag Co., New York (A, E)
•Auer, J. F., Inc., Mamaroneck, N. Y. (A, B)
Ben-Mont, The Dow Chemical Co., Dobeckmun Div., Bennington, Vt. (D)
Bristol Paper Products, Inc., Long Island City, N. Y. (A, D)
Canada Glazed Papers Ltd., Scarborough, Ont. (B, D)
•Cellu-Craft Products Corp., New Hyde Park, N. Y. (D)
Champion Papers, Inc., Hamilton, Ohio (B, D)
Chase Bag Co., New York (D)
Cincinnati Industries, Inc., Cincinnati (D)
•Coated Products, Inc., Middlesex, N. J. (B, E)
Crocker, Burbank Papers, Inc., Fitchburg, Mass. (D, E)
Crown Zellerbach Corp., Western-Waxide Div., San Leandro, Calif. (A, B, D)
•Crystal Tissue Co., Middletown, Ohio (B)
Dewey & Almy Chemical Div., W. R. Grace & Co., Cambridge, Mass. (A)
Dixie Wax Paper Co., Dallas, Texas (A, B)
Farrington Texol Corp., Walpole, Mass. (B)
Formed Container Corp., Sub. Phillips Petroleum Co., Orangeburg, N. Y. (D)
Girder Process, Inc., Hackensack, N. J. (A, B, C, D, E)
Gleason Industries, El Segundo, Calif. (A, D)
Hazen Paper Co., Holyoke, Mass. (B)
Holland Insulated Wire & Cable Works Ltd., Amsterdam, Holland (D)
•International Paper Co., New York (D)
KVP Sutherland Paper Co., Kalamazoo, Mich. (A, B, D)
•Knowlton, M. D., Co., Rochester, N. Y. (D)
Kupfer Bros. Co., New York (A, B)
Laminated Paper Products, Santa Clara, Calif. (A, E)
Lowe Paper Co., Ridgefield, N. J. (D, E)
•Ludlow Corp., Needham Heights, Mass. (B, C, D)
M & Q Plastic Products, Freehold, N. J. (C)
Marvellum Co., Holyoke, Mass. (A, B, D, E)
•Matthias Paper Corp., Philadelphia (A, B)
Mead Board Sales, Inc., Cincinnati (D)
Melrose Packaging Corp., Flushing, N. Y. (A, E)
•Milprint, Inc., Milwaukee (D)
Modern Packaging, Inc., Mt. Holly, N. J. (C, D)
Morrill Press, Fulton, N. Y. (B)
National Foil Co., Elizabeth, N. J. (B)
New England Card & Paper Co., Springfield, Mass. (E)
Newark Paraffine Paper Co., Newark, N. J. (D)
•Nichols Paper Products Co., Green Bay, Wis. (E)
Orchard Paper Co., St. Louis, Mo. (B, E)
Organico S.A., Paris, France (C)
Package Printing Co., W. Springfield, Mass. (D)
Paper Manufacturers Co., Philadelphia (A, E)
Paterson Parchment Paper Co., Bristol, Pa. (A, E)
Potlatch Forests, Inc., Lewiston, Idaho (D, E)
Protective Coatings Corp., Clifton, N. J. (C, D)
Pyrotex Co., Leominster, Mass. (B, E)
Raisin, John T., Corp., San Francisco (B)
Randolph Products Co., Carlstadt, N. J. (B)
Rap Industries, Inc., Minneapolis (A, B, D, E)
•Riegel Paper Co., New York (A, B, D, E)
Rollprint Products Corp., Chicago (B, D)
St. Regis Paper Co., New York (D)
Sayford Corp., Litchfield, Conn. (A, D)
Sealcraft Products Corp., Milwaukee (D)
Shopsin Paper Co., New York (B)
•Smith, H. P., Paper Co., Chicago (A, D)
Smith, Howard, Paper Mills Ltd., Montreal, Que. (D)
Solatech Coating Corp., New Rochelle, N. Y. (B, E)
Specialty Converters, Inc., E. Braintree, Mass. (A)
Standard Insulation Co., E. Rutherford, N. J. (D, E)
•Standard Packaging Corp., New York (A, B, C, D, E)
•Thilmany Pulp & Paper Co., Kaukauna, Wis. (A, B, C, D, E)
Unger Laminating Co., Brooklyn, N. Y. (D, E)
Union Bag-Camp Paper Corp., New York (A, D, E)
VanPak Products, Inc., Tomah, Wis. (D)
Western Foil Converters, Inc., Berkeley, Calif. (B, D)

PAPER, CORRUGATED

A. Flexible, Wrapping & Packing
B. Plain or Printed (For Window Trimming)

Editorial information, Div. V Sec. 17

American Excelsior Corp., Chicago (A)
Bestpak, Inc., Natick, Mass. (A, B)
Binghamton Container Co., Binghamton, N. Y. (A)
Consolidated Paper Co., Monroe, Mich. (A)
Crown Zellerbach Corp., Industrial Paper Sales Div., San Francisco (A)
Excelsior Paper Specialties Co., No. Bergen, N. J. (A)
•Fibreboard Paper Products Corp., San Francisco (A)
Flintkote Co., Los Angeles (A)
Fuller Displays, Inc., Long Island City, N. Y. (B)
Gould, Stephen, Paper Co., Bayonne, N. J. (A)
Hinde & Dauch Div., West Virginia Pulp & Paper Co., Sandusky, Ohio (A)
Kankakee Container Co., Kankakee, Ill. (A)
Kieffer Paper Mills, Brownstown, Ind. (A)
Lanzit Corrugated Box Co., Chicago (A)
Lawless Bros. Container Corp., No. Tonawanda, N. Y. (A)
Lawrence Paper Co., Lawrence, Kan. (A, B)
Longview Fibre Co., Longview, Wash. (A)
Malanco, Inc., Blue Island, Ill. (A)
Mead Papers, Inc., Sub. The Mead Corp., Dayton, Ohio (A, B)
•Nichols Paper Products Co., Green Bay Wis. (A)
Progress Lithographing Co., Cincinnati (A, B)
Republic Container Corp., Jersey City, N. J. (A, B)

St. Regis Paper Co., New York (A, B)
Sayford Corp., Litchfield, Conn. (A)
Sherman Paper Products Co., Div. St. Regis Paper Co., Newton Upper Falls, Mass. (A)
Southern Paper Co., New Orleans, La. (A, B)
Strange, John, Paper Co., Menasha, Wis. (A)
Sweetnam, George H., Inc., Cambridge, Mass. (A)

PAPER, CREPE

Editorial information, Div. I Sec. 3

Arkell Safety Bag Co., New York
Artistic Mfg. Co., Div. Sun Chemical Corp., Stamford, Conn.
Brown Co., Boston
Central Waxed Paper Co., Div. St. Regis Paper Co., Chicago
Chase Bag Co., New York
Cincinnati Industries, Inc., Cincinnati
•Dennison Mfg. Co., Framingham, Mass.
Gilman Paper Co., New York
Lechner Pulp & Paper Co., Teaneck, N. J.
Longview Fibre Co., Longview, Wash.
•Ludlow Corp., Needham Heights, Mass.
Marvellum Co., Holyoke, Mass.
Melrose Packaging Corp., Flushing, N. Y.
Mosinee Paper Mills Co., Mosinee, Wis.
•Nichols Paper Products Co., Green Bay, Wis.
Port Huron Sulphite & Paper Co., Port Huron, Mich.
Ruberoid Co., Safepack Mills Div., New York
St. Regis Paper Co., New York
Shawano Paper Mills, Shawano, Wis.
•Thilmany Pulp & Paper Co., Kaukauna, Wis.
Tuttle Press Co., Appleton, Wis.
Unger Laminating Co., Brooklyn, N. Y.
Union Bag-Camp Paper Corp., New York

PAPER, EXTENSIBLE

Editorial information, Div. I Sec. 3

Albemarle Paper Mfg. Co., Richmond, Va.
Arkell Safety Bag Co., New York
Cincinnati Industries, Inc., Cincinnati
•Continental Can Co., Containerboard & Kraft Paper Div., New York
Crown Zellerbach Corp., Industrial Paper Sales Div., San Francisco
Fulton Cotton Mills, Atlanta, Ga.
•International Paper Co., New York
St. Regis Paper Co., New York
•Scott Paper Co., Hollingswood & Whitney Div., Philadelphia
Smith, Howard, Paper Mills Ltd., Montreal, Que.
Union Bag-Camp Paper Corp., New York
•West Virginia Pulp & Paper Co., New York

PAPER, FANCY PRINTED OR EMBOSSED

Editorial information, Div. I Sec. 3, Div. IV Sec. 15

American Lace Paper Co., Milwaukee
Andre Paper Box Co., San Leandro, Calif.
Artistic Mfg. Co., Div. Sun Chemical Corp., Stamford, Conn.
•Auer, J. F., Inc., Mamaroneck, N. Y.
Bellen Co., Chicago
Ben-Mont, The Dow Chemical Co., Dobeckmun Div., Bennington, Vt.
Bristol Paper Products, Inc., Long Island City, N. Y.
Canada Foils Ltd., Toronto, Ont.
Canada Glazed Papers Ltd., Scarborough, Ont.
Champion Papers, Inc., Hamilton, Ohio
Chase Bag Co., New York
•Continental Can Co., Containerboard & Kraft Paper Div., New York
Crown Zellerbach Corp., Western-Waxide Div., San Leandro, Calif.
Dejonge, Louis, & Co., New York
Dekcraft Corp., Syosset, N. Y.
•Dennison Mfg. Co., Framingham, Mass.
Farrington Texol Corp., Walpole, Mass.
Feder Industries, Inc., New York
Frann Paper Corp., Garden City E., N. Y.
Hampden Glazed Paper & Card Co., Holyoke, Mass.
Hazen Paper Co., Holyoke, Mass.
House of Harley, Inc., New York
Hy-Sil Mfg. Co., Revere, Mass.
KVP Sutherland Paper Co., Kalamazoo, Mich.
Kirchheimer Bros. Co., Chicago
Kupfer Bros. Co., New York
•Lachman-Novasel-Owens Paper Corp., New York
•Ludlow Corp., Needham Heights, Mass.
Maharam Fabric Corp., New York
Marvellum Co., Holyoke, Mass.
•Matthias Paper Corp., Philadelphia
Mead Papers, Inc., Sub. The Mead Corp., Dayton, Ohio
Miami Valley Coated Paper Co., Franklin, Ohio
•Milprint, Inc., Milwaukee
Narragansett Coated Paper Corp., Pawtucket, R. I.
•Nashua Corp., Nashua, N. H.
New England Card & Paper Co., Springfield, Mass.
Orchard Paper Co., St. Louis, Mo.
Papercraft Corp., Pittsburgh
Promotional Container Co., Newark, N. J.
Raisin, John T., Corp., San Francisco
•Riegel Paper Corp., New York
Rose Hill Lithographers, Inc., New York
Royal Paper Corp., New York
St. Regis Paper Co., New York
Sayford Corp., Litchfield, Conn.
Smith, Howard, Paper Mills Ltd., Montreal, Que.
Southern Paper Co., New Orleans, La.
•Standard Packaging Corp., New York
Texlon Corp., Dallas, Texas
•Thilmany Pulp & Paper Co., Kaukauna, Wis.
Tuttle Press Co., Appleton, Wis.
Unger Laminating Co., Brooklyn, N. Y.
Union Bag-Camp Paper Corp, New York
Wachusett Converters, Inc., Leominster, Mass.
Weil's, David, Sons Lithographic Co., Brooklyn, N. Y.
•West Virginia Pulp & Paper Co., New York
Western Foil Converters, Berkeley, Calif.
Wrapture, Inc., Flushing, N. Y.
Wyomissing Paper Products, Reading, Pa.

PAPER, FLINT GLAZED

Editorial information, Div. I Sec. 3

Dejonge, Louis, & Co., New York
Hampden Glazed Paper & Card Co., Holyoke, Mass.
Hazen Paper Co., Holyoke, Mass.
Kupfer Bros. Co., New York
•Lachman-Novasel-Owens Paper Corp., New York
Maharam Fabric Corp., New York
•Matthias Paper Corp., Philadelphia
Narragansett Coated Paper Corp., Pawtucket, R. I.
Royal Paper Corp., New York
Shopsin Paper Co., New York
Unger Laminating Co., Brooklyn, N. Y.
Wyomissing Paper Products, Reading, Pa.

PAPER, FOIL

Editorial information, Div. I Sec. 3, 4

Alufoil Products Co., New York
•Aluminum Co. of America, Pittsburgh
Artistic Mfg. Co., Div. Sun Chemical Corp., Stamford, Conn.
Ben-Mont, The Dow Chemical Co., Dobeckmun Div., Bennington, Vt.
Canada Foils, Ltd., Toronto, Ont.
Catty, H. D., Corp. of New York, Norwalk, Conn.
Champion Papers, Inc., Hamilton, Ohio
Crocker, Burbank Papers, Inc., Fitchburg, Mass.
Crown Zellerbach Corp. Western-Waxide Div., San Leandro, Calif.
Daniels Mfg. Co., Rhinelander, Wis.
Dejonge, Louis, & Co., New York
Dekcraft Corp., Syosset, N. Y.
Fisher's Foils Ltd., Wembley, Middx., England
Gummed Products Co., Div. St. Regis Paper Co., Troy, Ohio
Hampden Glazed Paper & Card Co., Holyoke, Mass.
Hazen Paper Co., Holyoke, Mass.
Hy-Sil Mfg. Co., Revere, Mass.
•International Paper Co., New York
KVP Sutherland Paper Co., Kalamazoo, Mich.
Kupfer Bros. Co., New York
•Lachman-Novasel-Owens Paper Corp., New York
Lechner Pulp & Paper Co., Teaneck, N. J.
•Ludlow Corp., Needham Heights, Mass.
Marvellum Co., Holyoke, Mass.
•Matthias Paper Corp., Philadelphia
Melrose Packaging Corp., Flushing, N. Y.
•Milprint, Inc., Milwaukee
Minerva Wax Paper Co., Minerva, Ohio
Minnesota & Ontario Paper Co., Minneapolis
Narragansett Coated Paper Corp., Pawtucket, R. I.
National Foil Co., Elizabeth, N. J.
Newark Foils, Inc., Newark, N. J.
Orchard Paper Co., St. Louis, Mo.
Papercraft Corp., Pittsburgh
Port Huron Sulphite & Paper Co., Port Huron, Mich.
R-W Paper Co., Longview, Wash.
Raisin, John T., Corp., San Francisco
Rap Industries, Inc., Minneapolis
Revere Copper & Brass, Inc., New York
•Reynolds Metals Co., Richmond, Va.
Rollprint Products Corp., Chicago
Royal Paper Corp., New York
St. Regis Paper Co., New York
Shopsin Paper Co., New York
Standard Insulation Co., E. Rutherford, N. J.
•Standard Packaging Corp., Johnston Foil Mfg. Div., St. Louis, Mo.
Texlon Corp., Dallas, Texas
•Thilmany Pulp & Paper Co., Kaukauna, Wis.
Unger Laminating Co., Brooklyn, N. Y.
Union Bag-Camp Paper Corp., New York
Venesta Foils Ltd., London, England
Wachusett Converters, Inc., Leominster, Mass.
Western Foil Co. of Seattle, Seattle, Wash.
Western Foil Converters, Inc., Berkeley, Calif.

PAPER, FRICTION GLAZED

Editorial information, Div. I Sec. 3

Canada Glazed Papers Ltd., Scarborough, Ont.
•Crystal Tissue Co., Middletown, Ohio
Dejonge, Louis, & Co., New York

Girder Process, Inc., Hackensack, N. J.
Hampden Glazed Paper & Card Co., Holyoke, Mass.
Kupfer Bros. Co., New York
•Lachman-Novasel-Owens Paper Corp., New York
•Matthias Paper Corp., Philadelphia
•Nashua Corp., Nashua, N. H.
New England Card & Paper Co., Springfield, Mass.
R-W Paper Co., Longview, Wash.
Shopsin Paper Co., New York
Unger Laminating Co., Brooklyn, N. Y.
Wyomissing Paper Products, Reading, Pa.

PAPER, GLASSINE

A. Greaseproof
B. Lacquered
C. Laminated
D. Waxed

Editorial information, Div. I Sec. 3

Albemarle Paper Mfg. Co., Richmond, Va. (A, D)
Arkell & Smiths, Hudson Falls, N. Y. (B, D)
•Auer, J. F., Inc., Mamaroneck, N. Y. (A, D)
Canada Foils Ltd., Toronto, Ont. (C)
Central Waxed Paper Co., Div. St. Regis Paper Co., Chicago (A, B, C, D)
Crown Zellerbach Corp., Western-Waxide Div., San Leandro, Calif. (A, B, C, D)
Daniels Mfg. Co., Rhinelander, Wis. (A, B, C)
Deerfield Glassine Co., Monroe Bridge, Mass. (A, C, D)
Dixie Wax Paper Co., Dallas, Texas (A, B, C, D)
Fisher's Foils Ltd., Wembley, Middx., England (C)
G. & B. Bakers Supply Corp., No. Bergen, N. J. (A, C)
Gummed Products Co., Div. St. Regis Paper Co., Troy, Ohio (C)
•Hamersley Mfg. Co., Garfield, N. J. (A, C, D)
Henle Wax Paper Mfg. Co., Bronx, N. Y. (A, D)
Lechner Pulp & Paper Co., Teaneck, N. J. (A)
•Matthias Paper Corp., Philadelphia (A, B, C, D)
Melrose Packaging Corp., Flushing, N. Y. (C, D)
Minerva Wax Paper Co., Minerva, Ohio (C, D)
Minnesota Mining & Mfg. Co., St. Paul, Minn. (A, C, D)
Modern Packaging, Inc., Mt. Holly, N. J. (C)
•Nashua Corp., Nashua, N. H. (A)
Newark Paraffine Paper Co., Newark, N. J. (D)
•Nichols Paper Products Co., Green Bay, Wis. (C, D)
Palo Laboratory Supplies, Inc., New York (A, B, C, D)
Paperboard Laminating Corp., Norwalk, Conn. (C)
R-W Paper Co., Longview, Wash. (A, C)
Rap Industries, Inc., Minneapolis (C, D)
•Rhinelander Paper Co., Div. St. Regis Paper Co., Rhinelander, Wis. (A, B, C, D)
•Riegel Paper Corp., New York (A, B, C, D)
St. Regis Paper Co., New York (A, C, D)
Saniwax Paper Co., Kalamazoo, Mich. (D)
Sherman Paper Products Co., Div. St. Regis Paper Co., Newton Upper Falls, Mass. (A, C, D)
•Smith, H. P., Paper Co., Chicago (A, C, D)
Smith, Howard, Paper Mills Ltd., Montreal, Que. (A, C)
Southern Special Products, Richmond, Va. (A, C)
Specialty Papers Co., Dayton, Ohio (C, D)
•Standard Packaging Corp., General Felt Products Div., Brooklyn, N. Y. (A, B, C, D)
Sweetnam, George H., Inc., Cambridge, Mass. (A)
•Thilmany Pulp & Paper Co., Kaukauna, Wis. (A, B, C, D)
Unger Laminating Co., Brooklyn, N. Y. (C)
Union Bag-Camp Paper Corp., New York (C, D)
Western Foil Converters, Inc., Berkeley, Calif. (B, C)
•Westfield River Paper Co., Russell, Mass. (A, C, D)

PAPER, GUMMED

Editorial information, Div. I Sec. 5, Div. IV Sec. 16

Adhesive Products, Inc., Albany, Calif.
•Brown-Bridge Mills, Inc., Troy, Ohio
Crown Zellerbach Corp., Industrial Paper Sales Div., San Francisco
•Dennison Mfg. Co., Framingham, Mass.
Dickinson, John, & Co., Hemel Hempstead, Herts, England
Gilman Paper Co., New York
Gummed Products Co., Div. St. Regis Paper Co., Troy, Ohio
Kupfer Bros. Co., New York
•Ludlow Corp., Needham Heights, Mass.
Marvellum Co., Holyoke, Mass.
•Matthias Paper Corp., Philadelphia
Mid-States Gummed Paper Div., Minnesota Mining & Mfg. Co., Bedford Park, Ill.
Minnesota & Ontario Paper Co., Minneapolis
•Nashua Corp., Nashua, N. H.
Paper Manufacturers Co., Philadelphia
Phoenix Products Co., Milwaukee
Rexford Paper Co., Milwaukee
St. Regis Paper Co., New York
Shopsin Paper Co., New York
Smith, Howard, Paper Mills Ltd., Montreal, Que.
Superior Tape Corp., So. Hackensack, N. J.
Thomas Stationery Mfg. Co., Springfield, Ohio
Union Bag-Camp Paper Corp., New York

PAPER, IMITATION FOIL

Editorial information, Div. I Sec. 3, Div. IV Sec. 15

Ben-Mont, The Dow Chemical Co., Dobeckmun Div., Bennington, Vt.
Central Waxed Paper Co., Div. St. Regis Paper Co., Chicago
•Coated Products, Inc., Middlesex, N. J.
Crown Zellerbach Corp., Western-Waxide Div., San Leandro, Calif.
Hazen Paper Co., Holyoke, Mass.
Kupfer Bros. Co., New York
•Lachman-Novasel-Owens Paper Corp., New York
•Ludlow Corp., Needham Heights, Mass.
Marvellum Co., Holyoke, Mass.
•Matthias Paper Corp., Philadelphia
Narragansett Coated Paper Corp., Pawtucket, R. I.
Orchard Paper Co., St. Louis, Mo.
•Riegel Paper Corp., New York
Royal Paper Corp., New York
Shopsin Paper Co., New York
•Standard Packaging Corp., New York
•Thilmany Pulp & Paper Co., Kaukauna, Wis.
Unger Laminating Co., Brooklyn, N. Y.
Wyomissing Paper Products, Reading, Pa.

PAPER, IMPREGNATED

Editorial information, Div. I Sec. 3

Albemarle Paper Mfg. Co., Richmond, Va.
Arkell Safety Bag Co., New York
Canada Foils Ltd., Toronto, Ont.
Central Waxed Paper Co., Div. St. Regis Paper Co., Chicago
•Coated Products, Inc., Middlesex, N. J.
Crocker, Burbank Papers, Inc., Fitchburg, Mass.
•Cromwell Paper Co., Chicago
Crown Zellerbach Corp., Western-Waxide Div., San Leandro, Calif.
•Crystal Tissue Co., Middletown, Ohio
Dewey & Almy Chemical Div., W. R. Grace & Co., Cambridge, Mass.
Farrington Texol Corp., Walpole, Mass.
Gilman Paper Co., New York
Henle Wax Paper Mfg. Co., Bronx, N. Y.
KVP Sutherland Paper Co., Kalamazoo, Mich.
Kupfer Bros. Co., New York
•Ludlow Corp., Needham Heights, Mass.
•Matthias Paper Corp., Philadelphia
Mead Papers, Inc., Sub. The Mead Corp., Dayton, Ohio
Melrose Packaging Corp., Flushing, N. Y.
Miami Valley Coated Paper Co., Franklin, Ohio
Minerva Wax Paper Co., Minerva, Ohio
•Nichols Paper Products Co., Green Bay, Wis.
Orchard Paper Co., St. Louis, Mo.
Paterson Parchment Paper Co., Bristol, Pa.
Rexford Paper Co., Milwaukee
St. Regis Paper Co., New York
Silicone Paper Co. of America, New York
Specialty Papers Co., Dayton, Ohio
•Standard Packaging Corp., General Felt Products Div., Brooklyn, N. Y.
•Thilmany Pulp & Paper Co., Kaukauna, Wis.
Unger Laminating Co., Brooklyn, N. Y.
Union Bag-Camp Paper Corp., New York

PAPER, KRAFT

Editorial information, Div. I Sec. 3

Albemarle Paper Mfg. Co., Richmond, Va.
Brown Co., Boston
Champion Papers, Inc., Hamilton, Ohio
Chase Bag Co., New York
•Continental Can Co., Containerboard & Kraft Paper Div., New York
•Crossett Paper Mills, Crossett, Ark.
Crown Zellerbach Corp., Western-Waxide Div., San Leandro, Calif.
•Crystal Tissue Co., Middletown, Ohio
•Fibreboard Paper Products Corp., San Francisco
Georgia-Pacific Paper Co., Portland, Ore.
Gilman Paper Co., New York
Henle Wax Paper Mfg. Co., Bronx, N. Y.
•International Paper Co., New York
Kupfer Bros. Co., New York
Lechner Pulp & Paper Co., Teaneck, N. J.
Longview Fibre Co., Longview, Wash.
•Ludlow Corp., Needham Heights, Mass.
•Matthias Paper Corp., Philadelphia
Mead Papers, Inc., Sub. The Mead Corp., Dayton, Ohio
Minnesota & Ontario Paper Co., Minneapolis
Mosinee Paper Mills Co., Mosinee, Wis.
•Nashua Corp., Nashua, N. H.
•Olin, Packaging Div., Forest Products Operations, W. Monroe, La.
•Riegel Paper Corp., New York
St. Regis Paper Co., New York
•Scott Paper Co., Hollingsworth & Whitney Div., Philadelphia

Addresses of companies listed appear on pp. 808-847

Smith, Howard, Paper Mills Ltd., Montreal, Que.
Southern Special Products, Richmond, Va.
•Thilmany Pulp & Paper Co., Kaukauna, Wis.
Twitchell, E. W., Inc., Packaging Div., Philadelphia
Union Bag-Camp Paper Corp., New York
•West Virginia Pulp & Paper Co., New York

PAPER, MOLD-INHIBITING

Editorial information, Div. I Sec. 3

Albemarle Paper Mfg. Co., Richmond, Va.
Appleton Coated Paper Co., Appleton, Wis.
Champion Papers, Inc., Hamilton, Ohio
Crocker, Burbank Papers, Inc., Fitchburg, Mass.
Crown Zellerbach Corp., Western-Waxide Div., San Leandro, Calif.
•Crystal Tissue Co., Middletown, Ohio
Henle Wax Paper Mfg. Co., Bronx, N. Y.
KVP Sutherland Paper Co., Kalamazoo, Mich.
Kieffer Paper Mills, Brownstown, Ind.
Kupfer Bros. Co., New York
•Matthias Paper Corp., Philadelphia
Minnesota & Ontario Paper Co., Minneapolis
Mosinee Paper Mills Co., Mosinee, Wis.
Orchard Paper Co., St. Louis, Mo.
Oxford Paper Co., New York
Paterson Parchment Paper Co., Bristol, Pa.
Potlatch Forests, Inc., Lewiston, Idaho
•Rhinelander Paper Co., Div. St. Regis Paper Co., Rhinelander, Wis.
•Riegel Paper Corp., New York
Smith, Howard, Paper Mills, Ltd., Montreal, Que.
•Standard Packaging Corp., General Felt Products Div., Brooklyn, N. Y.
•Thilmany Pulp & Paper Co., Kaukauna, Wis.
Wyomissing Paper Products, Reading, Pa.

PAPER, PRESSURE-SENSITIVE-ADHESIVE COATED

Editorial information, Div. I Sec. 3, 5

Adhesive Tape Corp., Brooklyn, N. Y.
Arkell Safety Bag Co., New York
Arno Adhesive Tapes, Inc., Michigan City, Ind.
Behr-Manning Co., Troy, N. Y.
Bro-Dart Industries, Newark, N. J.
•Brown-Bridge Mills, Inc., Troy, Ohio
•Coated Products, Inc., Middlesex, N. J.
•Dennison Mfg. Co., Framingham, Mass.
Devon Tape Corp., Mt. Vernon, N. Y.
Emerson Labeltape & Supply Corp., Brooklyn, N. Y.
Fasson Products, Div. Avery Adhesive Products, Inc., Painesville, Ohio
Girder Process, Inc., Hackensack, N. J.
Hampton Mfg. Co., Industrial Tape Div., New Rochelle, N. Y.
Johns-Manville, New York
Kendall Co., Polyken Sales Div., Chicago
Kleen-Stik Products, Inc., Chicago
Kleen-Stik Products Ltd., Weston, Ont.
Linear Products, Inc., New York
•Ludlow Corp., Needham Heights, Mass.
M & Q Plastic Products, Freehold, N. J.
Melrose Packaging Corp., Flushing, N. Y.
Mid-States Gummed Paper Div., Minnesota Mining & Mfg. Co., Bedford Park, Ill.
Minnesota Mining & Mfg. Co., St. Paul, Minn.
Morgan Adhesives Co., Stow, Ohio
Orchard Paper Co., St. Louis, Mo.
Paper Manufacturers Co., Philadelphia
Phoenix Products Co., Milwaukee
Pres-Sure-Stik Corp., New York
Presto Adhesive Paper Co., Glendale, Calif.
St. Regis Paper Co., New York
Sherman Paper Products Co., Div. St. Regis Paper Co., Newton Upper Falls, Mass.
•Standard Packaging Corp., General Felt Products Div., Brooklyn, N. Y.
Union Bag-Camp Paper Corp., New York

PAPER, TISSUE

(Plain, Protective & Specialty)

Editorial information, Div. I Sec. 3

Artistic Mfg. Co., Div. Sun Chemical Corp., Stamford, Conn.
•Auer, J. F., Inc., Mamaroneck, N. Y.
Ben-Mont, The Dow Chemical Co., Dobeckmun Div., Bennington, Vt.
Brooks Paper Co., St. Louis, Mo.
Crown Zellerbach Corp., Western-Waxide Div., San Leandro, Calif.
•Crystal Tissue Co., Middletown, Ohio
Dekcraft Corp., Syosset, N. Y.
•Dennison Mfg. Co., Framingham, Mass.
Dexter, C. H., & Sons, Inc., Windsor Locks, Conn.
Lechner Pulp & Paper Co., Teaneck, N. J.
•Matthias Paper Corp., Philadelphia
•Nashua Corp., Nashua, N. H.
Orchard Paper Co., St. Louis, Mo.
Port Huron Sulphite & Paper Co., Port Huron, Mich.
•Rhinelander Paper Co., Div. St. Regis Paper Co., Rhinelander, Wis.
•Riegel Paper Corp., New York
St. Regis Paper Co., New York
Shawano Paper Mills, Shawano, Wis.
Silicone Paper Co. of America, Inc., New York
•Thilmany Pulp & Paper Co., Kaukauna, Wis.
Twitchell, E. W., Inc., Packaging Div., Philadelphia

PAPER, TRADEMARKED

Editorial information, Div. I Sec. 3

•Auer, J. F., Inc., Mamaroneck, N. Y.
Canada Glazed Papers Ltd., Scarborough, Ont.
Champion Papers, Inc., Hamilton, Ohio
•Continental Can Co., Containerboard & Kraft Paper Div., New York
Dejonge, Louis, & Co., New York
Eureka Specialty Printing Co., Scranton, Pa.
Frann Paper Corp., Garden City E., N. Y.
Fraser Paper, Ltd., New York
Hampden Glazed Paper & Card Co., Holyoke, Mass.
Hazen Paper Co., Holyoke, Mass.
•International Paper Co., New York
Kirchheimer Brothers Co., Chicago
Kupfer Bros. Co., New York
•Lachman-Novasel-Owens Paper Corp., New York
Marvellum Co., Holyoke, Mass.
•Matthias Paper Corp., Philadelphia
Mead Papers, Inc., Sub. The Mead Corp., Dayton, Ohio
New England Card & Paper Co., Springfield, Mass.
Orchard Paper Co., St. Louis, Mo.
Paterson Parchment Paper Co., Bristol, Pa.
Raisin, John T., Corp., San Francisco
Rose Hill Lithographers, Inc., New York
Royal Paper Corp., New York
Sweetnam, George H., Inc., Cambridge, Mass.
•Thilmany Pulp & Paper Co., Kaukauna, Wis.
Union Bag-Camp Paper Corp., New York
Wachusett Converters, Inc., Leominster, Mass.
Wyomissing Paper Products, Reading, Pa.

PAPER, VACUUM-METALLIZED

Editorial information, Div. I Sec. 3

Dixie Wax Paper Co., Dallas, Texas
•Matthias Paper Corp., Philadelphia
•Milprint, Inc., Milwaukee
Minnesota Mining & Mfg. Co., St. Paul, Minn.
Robeco Chemicals, Inc., New York
Royal Paper Corp., New York
•Standard Packaging Corp., New York

PAPER, VEGETABLE PARCHMENT

Editorial information, Div. I Sec. 3

KVP Sutherland Paper Co., Kalamazoo, Mich.
Kleist & Co., Portland, Ore.
Paterson Parchment Paper Co., Bristol, Pa.

PAPER, VELOUR

(Plain, Printed, Embossed)

Editorial information, Div. IV Sec. 15

Artistic Mfg. Co., Div. Sun Chemical Corp., Stamford, Conn.
•Auer, J. F., Inc., Mamaroneck, N. Y.
Cellusuede Products, Inc., Rockford, Ill.
Dejonge, Louis, & Co., New York
Feder Industries, Inc., New York
Kupfer Bros. Co., New York
•Lachman-Novasel-Owens Paper Corp., New York
Maharam Fabric Corp., New York
Marquardt & Co., New York
•Matthias Paper Corp., Philadelphia
Mead Papers, Inc., Sub. The Mead Corp., Dayton, Ohio
•Nashua Corp., Nashua, N. H.
Orchard Paper Co., St. Louis, Mo.
Promotional Container Co., Newark, N. J.
Shopsin Paper Co., New York
•Standard Packaging Corp., General Felt Products Div., Brooklyn, N. Y.
Synthon, Inc., Cambridge, Mass.
Unger Laminating Co., Brooklyn, N. Y.

PAPER, VOLATILE CORROSION INHIBITING

Editorial information, Div. I Sec. 3

Canada Glazed Papers Ltd., Scarborough, Ont.
•Cromwell Paper Co., Chicago
Daubert Chemical Co., Chicago
•Ludlow Corp., Needham Heights, Mass.
Marvellum Co., Holyoke, Mass.
•Matthias Paper Corp., Philadelphia
Orchard Paper Co., St. Louis, Mo.
R. & R. Paper Converting Co., Los Angeles
St. Regis Paper Co., New York
Sherman Paper Products Co., Div. St. Regis Paper Co., Newton Upper Falls, Mass.
•Standard Packaging Corp., General Felt Products Div., Brooklyn, N. Y.
•Thilmany Pulp & Paper Co., Kaukauna, Wis.

PAPER, WATERPROOF

Editorial information, Div. I Sec. 3

Albemarle Paper Mfg. Co., Richmond, Va.
American Sisalkraft Corp., Attleboro, Mass.
Arkell Safety Bag Co., New York
Canada Glazed Papers Ltd., Scarborough, Ont.
Chase Bag Co., New York
Cincinnati Industries, Inc., Cincinnati
•Continental Can Co., Containerboard & Kraft Paper Div., New York
Crocker, Burbank Papers, Inc., Fitchburg, Mass.
•Cromwell Paper Co., Chicago
Crown Zellerbach Corp., Western-Waxide Div., San Leandro, Calif.
Dejonge, Louis, & Co., New York
Fulton Cotton Mills, Atlanta, Ga.
Hampden Glazed Paper & Card Co., Holyoke, Mass.
Hazen Paper Co., Holyoke, Mass.
•International Paper Co., New York
KVP Sutherland Paper Co., Kalamazoo, Mich.
Kupfer Bros. Co., New York
Lowe Paper Co., Ridgefield, N. J.
•Ludlow Corp., Needham Heights, Mass.
Marvellum Co., Holyoke, Mass.
•Matthias Paper Corp., Philadelphia
Mosinee Paper Mills Co., Mosinee, Wis.
•Nichols Paper Products Co., Green Bay, Wis.
Rap Industries, Inc., Minneapolis
•Riegel Paper Corp., New York
Ruberoid Co., Safepack Mills Div., New York
Sherman Paper Products Co., Div. St. Regis Paper Co., Newton Upper Falls, Mass.
Smith, Howard, Paper Mills Ltd., Montreal, Que.
Southern Special Products, Richmond, Va.
Standard Insulation Co., E. Rutherford, N. J.
•Standard Packaging Corp., General Felt Products Div., Brooklyn, N. Y.
•Thilmany Pulp & Paper Co., Kaukauna, Wis.
Union Bag-Camp Paper Corp., New York
VanPak Products, Inc., Tomah, Wis.
Weyerhaeuser Co., Tacoma, Wash.

PAPER, WAXED

Editorial information, Div. I Sec. 3

Albemarle Paper Mfg. Co., Richmond, Va.
Arkell Safety Bag Co., New York
•Auer, J. F., Inc., Mamaroneck, N. Y.
Central States Paper & Bag Co., St. Louis, Mo.
Central Waxed Paper Co., Div. St. Regis Paper Co., Chicago
Cincinnati Industries, Inc., Cincinnati
•Cromwell Paper Co., Chicago
Crown Zellerbach Corp., Western-Waxide Div., San Leandro, Calif.
•Crystal Tissue Co., Middletown, Ohio
Fabricon Products, River Rouge, Mich.
Gilman Paper Co., New York
•Hamersley Mfg. Co., Garfield, N. J.
Henle Wax Paper Mfg. Co., Bronx, N. Y.
•International Paper Co., New York
KVP Sutherland Paper Co., Kalamazoo, Mich.
Longview Fibre Co., Longview, Wash.
•Marathon, Div. American Can Co., Menasha, Wis.
Marvellum Co., Holyoke, Mass.
•Matthias Paper Corp., Philadelphia
Melrose Packaging Corp., Flushing, N. Y.
Mid-West Wax Paper Co., Fort Madison, Iowa
Minerva Wax Paper Co., Minerva, Ohio
•Nashua Corp., Nashua, N. H.
Newark Paraffine Paper Co., Newark, N. J.
•Nichols Paper Products Co., Green Bay, Wis.
Paterson Parchment Paper Co., Bristol, Pa.
Pollock Paper Co., Div. St. Regis Paper Co., Dallas, Texas
Rap Industries, Inc., Minneapolis
•Riegel Paper Corp., New York
St. Regis Paper Co., New York
Saniwax Paper Co., Kalamazoo, Mich.
Sayford Corp., Litchfield, Conn.
•Scott Paper Co., Hollingsworth & Whitney Div., Philadelphia
Sherman Paper Products Co., Div. St. Regis Paper Co., Newton Upper Falls, Mass.
Smith, Howard, Paper Mills Ltd., Montreal, Que.
Southern Paper Co., New Orleans, La.
Specialty Papers Co., Dayton, Ohio
•Standard Packaging Corp., General Felt Products Div., Brooklyn, N. Y.
•Thilmany Pulp & Paper Co., Kaukauna, Wis.
Union Bag-Camp Paper Corp., New York
•Westfield River Paper Co., Russell, Mass.

PAPER, WET STRENGTH

Editorial information, Div. I Sec. 3

Albemarle Paper Mfg. Co., Richmond, Va.
American Sisalkraft Corp., Attleboro, Mass.
Arkell Safety Bag Co., New York
Brown Co., Boston
Canada Paper Co., Montreal, Que.
Central Waxed Paper Co., Div. St. Regis Paper Co., Chicago
Cincinnati Industries, Inc., Cincinnati
•Continental Can Co., Containerboard & Kraft Paper Div., New York
Crocker, Burbank Papers, Inc., Fitchburg, Mass.
•Crossett Paper Mills, Crossett, Ark.
Crown Zellerbach Corp., Western-Waxide Div., San Leandro, Calif.
•Crystal Tissue Co., Middletown, Ohio
Daniels Mfg. Co., Rhinelander, Wis.
Dexter, C. H., Sons, Inc., Windsor Locks, Conn.
•Fibreboard Paper Products Corp., San Francisco
Fraser Paper, Ltd., New York
Fulton Cotton Mills, Atlanta, Ga.
Georgia-Pacific Paper Co., Portland, Ore.
Gilman Paper Co., New York
Henle Wax Paper Mfg. Co., Bronx, N. Y.
•International Paper Co., New York
KVP Sutherland Paper Co., Kalamazoo, Mich.
Longview Fibre Co., Longview, Wash.
•Matthias Paper Corp., Philadelphia
Mead Papers, Inc., Sub. The Mead Corp., Dayton, Ohio
Minnesota Mining & Mfg. Co., St. Paul, Minn.
Mosinee Paper Mills Co., Mosinee, Wis.
•Olin, Packaging Div., Forest Products Operations, W. Monroe, La.
Oxford Paper Co., New York
Paterson Parchment Paper Co., Bristol, Pa.
Port Huron Sulphite & Paper Co., Port Huron, Mich.
R-W Paper Co., Longview, Wash.
•Rhinelander Paper Co., Div. St. Regis Paper Co., Rhinelander, Wis.
•Riegel Paper Corp., New York
St. Regis Paper Corp., New York
Shawano Paper Mills, Shawano, Wis.
•Smith, H. P., Paper Co., Chicago
Smith, Howard, Paper Mills Ltd., Montreal, Que.
•Thilmany Pulp & Paper Co., Kaukauna, Wis.
Union Bag-Camp Paper Corp., New York
VanPak Products, Inc., Tomah, Wis.
•Warren, S. D., Co., Boston
•West Virginia Pulp & Paper Co., New York
•Westfield River Paper Co., Russell, Mass.

PAPERBOARD

(See Boxboard)

PARTITIONS

A. Paper- & Container-Board
B. Wood

Editorial information, Div. V Sec. 17

Acme Partition Co., Newark, N. J. (A)
American Partition Co., Div. Standard Brands, Inc., Milwaukee (A)
Atlas General Industries, Inc., New York (B)
Bell, Edwin, Cooperage Co., Pittsburgh (A)
Bennett Products, Inc., Rockford, Ill. (A)
Bogert & Hopper, Inc., New York (B)
Bradford, W. J., Paper Co., Chicago (A)
Burton Packaging Co., Brooklyn, N. Y. (A)
Central Paper Box Co., Philadelphia (A)
Central Paper Box Co., Lancaster, Pa. (A)
Chicago Carton Co., Div. Waldorf Paper Products Co., Chicago (A)
Chicago Wood & Plastic Products, Chicago (B)
•Cincinnati Box & Partition Co., Cincinnati (A)
Consolidated Paper Co., Monroe, Mich. (A)
Ellis Paperboard Products, Inc., Portland, Maine (A)
Gem Corrugated Box Corp., New York (A)
Gleason Industries, El Segundo, Calif. (A)
Gould, Stephen, Paper Co., Bayonne, N. J. (A)
Hill Mfg. Co., Lyndonville, Vt. (B)
Hill & Neumann Co., Jersey City, N. J. (B)
•Hoerner Boxes, Inc., Keokuk, Iowa (A)
Hope Paper Box Co., Providence, R. I. (A)
•International Paper Co., New York (A)
Lansky Die Cutting Corp., Brooklyn, N. Y. (A)
Longview Fibre Co., Longview, Wash. (A)
Marion Paper Box Co., Marion, Ind. (A)
Mead Containers Div., The Mead Corp., Cincinnati (A)
Minnesota Filler Co., Minneapolis (A)
Moraine Box Co., Dayton, Ohio (B)
Murnane Paper Co., Northlake, Ill. (A)
New England Box Co., Greenfield, Mass. (B)
O'Grady Containers, Inc., Fort Worth, Texas (A)
•Olin, Packaging Div., Forest Products Operations, W. Monroe, La. (A)
•Owens-Illinois Glass Co., Toledo, Ohio (A)
•Packaging Corp. of America, Evanston, Ill. (A)
Packaging Material Co., Detroit (B)
•Peter Partition Corp., Brooklyn, N. Y. (A)
Republic Container Corp., Jersey City, N. J. (A)
River Raisin Paper Co., Div. Union Bag-Camp Paper Corp., Monroe, Mich. (A)
•Rondo of America, Inc., Hamden, Conn. (A)

Schmidt & Ault Paper Co., Div. St. Regis Paper Co., York, Pa. (A)
Sherman Paper Products Co., Div. St. Regis Paper Co., Newton Upper Falls, Mass. (A)
•Standard Packaging Corp., Bradley & Gilbert Div., Louisville, Ky. (A)
Stone Container Corp., Chicago (A)
Treen Box Co., Philadelphia (A, B)
Wabash Fibre Box Co., Div. The Weston Paper & Mfg. Co., Terre Haute, Ind. (A)
•West Virginia Pulp & Paper Co., New York (A)
Weyerhaeuser Co., Shipping Container Div., Chicago (A)
Yardley Box Co., Chicago, Ill. (B)
Zuckerman, Joseph, Inc., Yonkers, N. Y. (A)

PLASTIC FILMS

(See Films, Plastic)

PLASTIC RESINS

A. *Acetal*
B. *Acrylics*
C. *Cellulose Acetate*
D. *Cellulose Acetate Butyrate*
E. *Cellulose Propionate*
F. *Melamine*
G. *Nylon*
H. *Phenolic*
I. *Polyethylene, Low-Density*
J. *Polyethylene, Medium-Density*
K. *Polyethylene, High-Density*
L. *Polypropylene*
M. *Polystyrene & polystyrene compounds*
N. *Urea*

Editorial information, Div. II Sec. 8

•Allied Chemical Corp., Plastics Div., New York (F, G, H, I, K, N)
American Cyanamid Co., Plastics & Resins Div., Wallingford, Conn. (F, N)
American Molding Powder & Chemical Corp., Brooklyn, N. Y. (I, J, K)
American Pyroxylin Corp., Arlington, N. J. (B, C, D, I, J, K)
•American Viscose Corp., Philadelphia (N)
•AviSun Corp., Philadelphia (L)
Belding Corticelli Industries, New York (G)
Borden Chemical Co., New York (B, H, M, N)
Catalin Corp. of America, New York (B, F, G, H, I, J, K, L, M, N)
•Celanese Polymer Co., Div. Celanese Corp. of America, Newark, N. J. (A, C, E, I, J, K)
Colorite Plastics, Inc., Paterson, N. J. (I, J, K)
•Davis, Joseph, Plastics Co., Kearny, N. J. (C)
De Soto Chemical Coatings, Inc., Chicago (B)
•Dow Chemical Co., Midland, Mich. (I, J, K, L, M)
•du Pont de Nemours, E. I., & Co., Wilmington, Del. (A, B, C, G, I, J, K)
Durez Plastics Div., Hooker Chemical Corp., No. Tonawanda, N. Y. (H, L)
•Eastman Chemical Products, Inc., Kingsport, Tenn. (C, D, E, I, J, K, L)
•Enjay Chemical Co., Div. Humble Oil & Refining Co., New York (L)
Firestone Plastics Co., Div. Firestone Tire & Rubber Co., Pottstown, Pa. (G, L)
Foster Grant Co., Leominster, Mass. (G, M)
General Electric Co., Chemical Materials Dept., Pittsfield, Mass. (H)
Gering Plastics, Kenilworth, N. J. (B, C, D, G, I, J, K, L, M)
•Goodrich-Gulf Chemicals, Inc., Cleveland (K)
•Grace, W. R., & Co., Polymer Chemicals Div., Clifton, N. J. (I, J, K, M)
Hercules Powder Co., Wilmington, Del. (K, L)
Imperial Chemical Industries Ltd., London, England (B, G, H, I, L, N)
•Koppers Co., Pittsburgh (I, J, K, M)
•Ludlow Corp., Needham Heights, Mass. (G, I, J, K, L)
Marblette Corp., Long Island City, N. Y. (H)
Monsanto Chemical Co., St. Louis, Mo. (C, F, I, J, K, L, M)
Montecatini, Milano, Italy (B, F, H, I, K, L, M, N)
National Casein Co., Chicago (N)
Organico S.A., Paris, France (G)
Permacel, New Brunswick, N. J. (C, M)
•Phillips Chemical Co., Bartlesville, Okla. (I, J, K)
Plastic Materials & Polymers, Inc., Hicksville, N. Y. (B, C, I, J, K, L, M)
Rohm & Haas Co., Philadelphia (B)
Shawinigan Resins Corp., Springfield, Mass. (A)
Shell Chemical Co., Plastics & Resins Div., New York (I, J, K, M)
Spencer Chemical Co., Kansas City, Mo. (G, I, J, L)
•Union Carbide Plastics Co., Div. Union Carbide Corp., New York (H, I, J, K, L, M)
•U. S. Industrial Chemicals Co., Div. National Distillers & Chemical Corp., New York (I, J)
United States Rubber Co., New York (M)

PLASTIC SHEET (RIGID)

A. *Acetate Types*
B. *Biaxially-Oriented Polystyrene*
C. *Butyrate*
D. *Ethyl Cellulose*
E. *Modified Styrene*
F. *Nylon*
G. *Polyethylene*
H. *Polypropylene*
I. *Polystyrene*
J. *Vinyls*

Editorial information, Div. II Sec. 8

American Kleer-Vu Plastics, Inc., New York (A, G, H, J)
American Pyroxylin Corp., Arlington, N. J. (A)
Blossom Mfg. Co., Brooklyn, N. Y. (F, G, J)
Bonny Mfg. Co., Maynard, Mass. (F)
Bro-Dart Industries, Newark, N. J. (A, J)
Cadillac Plastic & Chemical Co., Detroit (C, E, F)
•Campco Div., Chicago Molded Products Corp., Chicago (A, C, E, F, G, H, I)
Canada Foils Ltd., Toronto, Ont. (A)
•Celanese Plastics Co., Div. Celanese Corp. of America, Newark, N. J. (A)
•Davis, Joseph, Plastics Co., Kearny, N. J. (A, B, C, D, E, G, H, I)
DeWitt Plastics, Auburn, N. Y. (C)
•Dow Chemical Co., Midland, Mich. (D, I)
•Eastman Kodak Co., Rochester, N. Y. (A)
Firestone Plastics Co., Div. Firestone Tire & Rubber Co., Pottstown, Pa. (J)
•Flex-O-Glass, Inc., Chicago (C, G, H, J)
Foster Grant Co., Leominster, Mass. (I)
Gilman Brothers Co., Gilman, Conn. (E, G, H, I)
•Goodyear Tire & Rubber Co., Akron, Ohio (J)
H & R Plastics Industries, Inc., Nazareth, Pa. (C, E, F, G, H, J)
Holland Insulated Wire & Cable Works Ltd., Amsterdam, Holland (G, J)
Imperial Chemical Industries Ltd., London, England (J)
Kalle A. G., Wiesbaden, Germany (G, H, J)
Keystone Packaging Service, Inc., Philipsburg, N. J. (F, G, H, J)
Lacollonge-Flexone, Paris, France (B, J)
M & Q Plastic Products, Freehold, N. J. (F)
•Mehl Mfg. Co., Cincinnati (G)
Midwest Plastic Products Co., Chicago Heights, Ill. (A, C, E, G, H)
Monsanto Chemical Co., St. Louis, Mo. (A, J)
•Nashua Corp., Nashua, N. H. (G, J)
•Nixon-Baldwin Chemicals, Inc., Nixon, N. J. (A, C, D, E, G, H, I, J)
Organico S.A., Paris, France (F)
Pierson Industries, Inc., Boston (G)
•Plax Corp., Hartford, Conn. (B)
Polypane Packaging Co., San Juan, P. R. (G)
Raritan Plastics Corp., Oakland, N. J. (E, G, H, I)
Reliance Plastic & Chemical Corp., Paterson, N. J. (G)
Robeco Chemicals, Inc., New York (A, J)
Ross & Roberts, Inc., Stratford, Conn. (J)
Rubber Corp. of America, New York (J)
Seiberling Rubber Corp., Plastics Div., Newcomerstown, Ohio (E, G, H, J)
Southern Plastics Co., Columbia, S. C. (A, C, D, E, F, G, H, I, J)
Superior Plastics, Inc., Chicago (A, C, D, G, H, I, J)
Thermoplastic Processes, Inc., Stirling, N. J. (A, E, G)
Thomas Plastikraft Corp., New Hartford, N. Y. (I)
Tupper Co., Woonsocket, R. I. (G)
•Union Carbide Plastics Co., Div. Union Carbide Corp., New York (J)
United States Rubber Co., New York (E)
Vacuum Plastics Corp., Columbus, Ohio (E, G)
Westlake Plastics Co., Lenni Mills, Pa. (A, E, F, G, H, I)
World Plastics, New York (A, C, D, E, G, H, I, J)

PLASTICIZERS

Editorial information, Div. I Sec. 4

Adhesive Products Corp., New York
Air Reduction Chemical & Carbide Co., Div. Air Reduction Co., New York
•Allied Chemical Corp., Plastics Div., New York
Borden Chemical Co., New York
•Celanese Polymer Co., Div. Celanese Corp. of America, Newark, N. J.
Commerce Chemical Corp., New York
•Dow Chemical Co., Midland, Mich.
•du Pont de Nemours, E. I., & Co., Wilmington, Del.
•Eastman Chemical Products, Inc., Kingsport, Tenn.
Glyco Chemicals, Div. Chas. L. Huisking & Co., New York
Goodrich, B. F., Chemical Co., Cleveland
Gordon-Lacey Chemical Products Co., Maspeth, N. Y.
Hercules Powder Co., Wilmington, Del.
Imperial Chemical Industries Ltd., London, England
Monsanto Chemical Co., St. Louis, Mo.
Montecatini, Milano, Italy

Pennsylvania Industrial Chemical Corp., Clairton, Pa.
Pfizer, Chas., & Co., Plastic & Plasticizer Dept., New York
Rubber Corp. of America, New York
Sherwin-Williams Co., Pigment, Color & Chemical Div., New York
Socony Mobil Oil Co., New York
Union Carbide Chemicals Co., New York
United States Rubber Co., Naugatuck Chemical Div., Naugatuck, Conn.

PLATFORMS

(For Individual Nesting)

A. Fluted Corrugated
B. Plastic

Editorial information, Div. V Sec. 17

Artmor Plastics Corp., Cumberland, Md. (B)
Averil, Inc., Miami, Fla. (B)
Bell, Edwin, Cooperage Co., Pittsburgh (A)
Carroll Box & Pallet Co., Los Angeles (A)
Clear-Vu Packaging Corp., New York (B)
Container Corp. of America, Chicago (B)
Curtis, S., & Son, Inc., Sandy Hook, Conn. (B)
Custom Merchandise Corp., Brooklyn, N. Y. (B)
•Dyna-Foam Div., Sun Chemical Corp., Ellenville, N. Y. (B)
Eastern Vacuum Forming Co., Asbury Park, N. J. (B)
Fabri-Kal Corp., Kalamazoo, Mich. (B)
Ideal Fishing Float Co., Richmond, Va. (B)
Kiernan-Hughes Co., Jersey City, N. J. (B)
Lacollonge-Flexone, Paris, France (B)
Landsberger Plastics Co., New York (B)
Mankato Paper Box Co., Mankato, Minn. (B)
Metal Edge Industries, Barrington, N. J. (A)
Modern-Miltex Corp., New York (B)
North Star Industries, Inc., Minneapolis (B)
•Packaging Components, Inc., New York (B)
•Packaging Corp. of America, Evanston, Ill. (A)
Pantasote Co., Panta-Pak Div., New York (B)
Plastic Enterprises, College Point, N. Y. (B)
•Plastofilm, Inc., Wheaton, Ill. (B)
•Plaxall, Inc., Long Island City, N. Y. (B)
Preservation Packaging, Inc., Hillside, N. J. (B)
Republic Container Corp., Jersey City, N. J. (A)
•Rondo of America, Inc., Hamden, Conn. (A)
Southern Plastic Products Co., Riviera Beach, Fla. (B)
Twinpak Ltd., Lachine, Que. (B)
United Container Co., Philadelphia (A)
Valley-National Corp., Milldale, Conn. (B)

PLUGS, METAL

A. Drum
B. Pail

Editorial information, Div. V Sec. 17

Clover Industries, Inc., Tonawanda, N. Y. (A)
•Continental Can Co., Metal Div., New York (B)
Rieke Metal Products Corp., Auburn, Ind (A, B)

PLUGS, PLASTIC

(Drum)

Editorial information, Div. V Sec. 17

Brilhart Plastics Corp., Mineola, N. Y.
Clover Industries, Inc., Tonawanda, N. Y.
Container Corp. of America, Chicago
Crystal-X Corp., Lenni Mills, Pa.
Delaware Barrel & Drum Co., Wilmington, Del.
Denver Plastics, Inc., Golden, Colo.
•Frank, Walter, Organization, Hillside, Ill.
H. & R. Plastics Industries, Inc., Nazareth, Pa.
Plastic Assembled Products, Inc., Baltimore, Md.
Rieke Metal Products Corp., Auburn, Ind.

PLYWOOD

Editorial information, Div. V Sec. 17

Atlas General Industries, Inc., New York
Brown Co., Boston
Lea, David M., & Co., Richmond, Va.
Moraine Box Co., Dayton, Ohio
New England Box Co., Greenfield, Mass.
Packing Material Co., Detroit
Potlatch Forests, Inc., Lewiston, Idaho
St. Regis Paper Co., New York
Townson, W. D., Lumber Co., Murphy, N. C.
•West Virginia Pulp & Paper Co., New York
Weyerhaeuser Co., Wood Products Div., Tacoma, Wash.

PRINTING PLATE SUPPLIES

(Unvulcanized Rubber, Matrix Materials, Backings, Etc.)

Editorial information, Div. IV Sec. 15

American Evatype Corp., Deerfield, Ill.
•du Pont de Nemours, E. I., & Co., Wilmington, Del.
Econo Products, Inc., Rochester, N. Y.
Goodrich, B. F., Industrial Products Co., Akron, Ohio
•Goodyear Tire & Rubber Co., Akron, Ohio
Ideal Roller & Mfg. Co., Chicago
International Eastern Co., New York
Melind, Louis, Co., Chicago
Minnesota Mining & Mfg. Co., St. Paul, Minn.
Monomelt Co., Minneapolis
Mosstype Corp., Waldwick, N. J.
Polychrome Corp., Yonkers, N. Y.
Weber Marking Systems Co., Mount Prospect, Ill.
•Williamson & Co., Caldwell, N. J.
Wilsolite Corp., Buffalo, N. Y.

PRINTING ROLLERS

(See ROLLERS in Machinery & Equipment Section)

PROPELLANTS, AEROSOL

Editorial information, Div. II Sec. 11

Air Reduction Sales Co., New York
•du Pont de Nemours, E. I., & Co., Wilmington, Del.
•General Chemical Div., Allied Chemical Corp., New York
Pennsalt Chemicals Corp., Philadelphia
Union Carbide Chemicals Co., New York

RIBBONS & TIES

A. Film, Plastic, Etc.
B. Paper
C. Textile
D. Tinsel

Editorial information, Div. IV Sec. 15

Academy Ribbon Mills, Burbank, Calif. (C, D)
Arbetter Ribbon & Mfg. Co., Chicago (A, C, D)
Artistic Mfg. Co., Div. Sun Chemical Corp., Stamford, Conn. (A, C, D)
Associated Label Co., Los Angeles (C)
•Auer, J. F., Inc., Mamaroneck, N. Y. (B)
Ben-Mont, The Dow Chemical Co., Dobeckmun Div., Bennington, Vt. (A, B, C, D)
Borden Chemical Co., New York (A)
Buser, Inc., Paterson, N. J. (C, D)
Crystal-X Corp., Lenni Mills, Pa. (A)
Dekcraft Corp., Syosset, N. Y. (A, B, C, D)
Delaware Ribbon Mfrs., Inc., Philadelphia (A, C, D)
•Dennison Mfg. Co., Framingham, Mass. (A, B, D)
Feder Industries, Inc., New York (A, B, C, D)
General Printed String Co., Milwaukee (C)
Goodbar Mfg. Co., Div., Hargood Ribbon Co., New York (A, B, C, D)
Hy-Sil Mfg. Co., Revere, Mass. (A, B, C, D)
Keystone Packaging Service, Inc., Philipsburg, N. J. (A)
Minnesota Mining & Mfg. Co., St. Paul, Minn. (A, C)
Papercraft Corp., Pittsburgh (A, C, D)
•Plas-Ties Co., Santa Ana, Calif. (A, B)
Rainbow Ribbons & Fabrics, Inc., New York (A, C, D)
Ralston, W., & Co. (Canada), Montreal, Que. (A)
Rosebud Mfg. Corp., New York (C)
Shear-Prinz Associates, Chicago (A, B, C, D)
Shore Line Industries, Inc., Clinton, Conn. (A)
•Standard Packaging Corp., National Metallizing Div., Trenton, N. J. (A, B, D)
Sun Chemical Corp., New York (A, B)
Swartz Mfg. Co., Dorchester, Mass. (A)
Texlon Corp., Dallas, Texas (A, D)
Thayer Mfg. Co., Maynard, Mass. (A, C, D)

ROLL LEAF, STAMPING FOIL

Editorial information, Div. IV Sec. 15

•Ackerman Gould Co., Oceanside, N. Y.
Admiral Coated Products, Inc., Hackensack, N. J.
•Apex Machine Co., College Point, N. Y.
Atlas Roll Leaf Corp., New York
•Bell-Mark Corp., Bloomfield, N. J.
Coughlin Mfg. Co., New York
Fisler, Royal E., Co., St. Louis, Mo.
•Gottscho, Adolph, Inc., Hillside, N. J.
•Kensol-Olsenmark, Inc., New York
Marking Products Ltd., Montreal, Que.
Mirro Aluminum Co., Manitowoc, Wis.
•Peerless Roll Leaf Co., Div. Howe Sound Co., Union City, N. J.
•Standard Packaging Corp., National Metallizing Div., Trenton, N. J.
•Swift, M., & Sons, Inc., Hartford, Conn.

RUBBER OR RESIN DISPERSIONS

(See Latex)

RULE, CUTTING & DIE MAKING

Editorial information, Div. IV Sec. 15

Helmold, J. F., & Bro., Inc., Chicago
Simonds Saw & Steel Co., Fitchburg, Mass.

SEALS

Embossed on Paper, Foil, Etc.

(See also Closures, Secondary)

Editorial information, Div. IV Sec. 16

Artistic Mfg. Co., Div. Sun Chemical Corp., Stamford, Conn.
•Allen Hollander Co., New York
•American Tag Co., Belleville, N. J.
Arkadia Label Corp., New York
Attleboro Printing & Embossing Co., Attleboro, Mass.
•Cameo Die & Label Co., New York
Canada Foils Ltd., Toronto, Ont.
•Chaspec Mfg. Co., Greenwich, Conn.
Dekcraft Corp., Syosset, N. Y.
•Dennison Mfg. Co., Framingham, Mass.
Dickinson, John, & Co., Hemel Hempstead, Herts., England
Eureka Specialty Printing Co., Scranton, Pa.
Ever Ready Label Corp., Belleville, N. J.
Fleming Potter Co., Peoria, Ill.
Foilcraft Printing Corp., New York
Foxon Co., Providence, R. I.
Industrial Lithographic Co., Brooklyn
Kaumagraph Co., Wilmington, Del.
Milwaukee Label & Seal Co., Milwaukee
Normandie Press, Inc., New York
Papercraft Corp., Pittsburgh
•Standard Packaging Corp., Closure Div., Chicago
Steigerwald, A. M., Co., Chicago
•Stoffel Seals Corp., Tuckahoe, N. Y.
Tablet & Ticket Co., Chicago
•Tompkins' Label Service, Philadelphia
Weil's, David, Sons Lithographic Co., Brooklyn, N. Y.

SEALS, METAL

A. Drum
B. Pail

Editorial information, Div. V Sec. 17

Continental Can Co., Metal Div., New York (A, B)
Rieke Metal Products Corp., Auburn, Ind. (A, B)
•Stoffel Seals Corp., Tuckahoe, N. Y. (A)

SPOOLS

A. Fibre
B. Plastic, Molded
C. Wood

Alfa Mfg. Co., Chicago (B)
American Paper Products Co., Philadelphia (A)
Baxter, J. C., Co., Minerva, Ohio (A)
Bogert & Hopper, Inc., New York (C)
Bonny Mfg. Co., Maynard, Mass. (A)
Boonton Molding Corp., Boonton, N. J. (B)
Brilhart Plastics Corp., Mineola, N. Y. (B)
Chicago Mailing Tube Co., Chicago (A)
Chicago Wood & Plastic Products, Chicago (B, C)
•Cleveland Container Co., Cleveland (A)
Container Corp. of America, Chicago (B)
Crescent Paper Tube Co., Covington, Ky. (A)
DuBois Plastic Products, Buffalo, N. Y. (B)
Estes, E. B., & Sons, New York (C)
Gardiner Paper Mills, Inc., Gardiner, Maine (A)
Injection Molding Corp., New York (B)
Marshall Paper Tube Co., Randolph, Mass. (A)
National Vulcanized Fibre Co., Wilmington, Del. (A, C)
•Owens-Illinois Glass Co., Toledo, Ohio (B)
R. C. Can Co., St. Louis, Mo. (A)
Sonoco Products Co., Hartsville, S. C. (A)
Standard Molding Corp., Dayton, Ohio (B)
Stone Container Corp., Chicago (A)
Superior Plastics, Inc., Chicago (B)
Whyte Mfg. Co., New York (B)

STAPLES, WIRE

Editorial information, Div. III Sec. 13

Acme Staple Co., W. Franklin, N. H.
•Acme Steel Co., Chicago
Arrow Fastener Co., Brooklyn, N. Y.
Automation Fastening Co., Cleveland
Bates Mfg. Co., W. Orange, N. J.
•Bostitch, Inc., E. Greenwich, R. I.
General Staple Co., New York
Heller Roberts Instruments Corp., Cleveland
International Staple & Machine Co., Herrin, Ill.
Mid-States Steel & Wire Co., Crawfordsville, Ind.
Precision Staple Corp., Sarasota, Fla.
Staplex Co., Brooklyn, N. Y.

STENCIL BOARD

Editorial information, Div. III Sec. 13

Champion Papers, Inc., Hamilton, Ohio
Diagraph-Bradley Industries, Inc., Herrin, Ill.
Ideal Stencil Machine Co., Belleville, Ill.
Marsh Stencil Machine Co., Belleville, Ill.
Matthews, Jas. H., & Co., Pittsburgh
O'Malley, M. J., Co., Springfield, Mass.
Pannier Corp., Pittsburgh
•Riegel Paper Corp., New York
•Standard Packaging Corp., Missisquoi Specialty Board Div., Sheldon Springs, Vt.

STOPPERS

A. Expanded Plastics
B. Glass
C. Polyethylene
D. Rubber

Editorial information, Div. II Sec. 10

•Anchor Hocking Glass Corp., Lancaster, Ohio (B)
Bel-Art Products, Pequannock, N. J. (C)
Container Corp. of America, Chicago (A)
Crystal-X Corp., Lenni Mills, Pa. (C)
Dale, John, Ltd., London, England (C)
•Erno Products Co., Philadelphia (A, B, C)
Evans Crowder Co., So. Lyon, Mich. (C, D)
Glo-Brite Foam Plastics, Inc., Chicago (A)
•Henlopen Mfg. Co., Brooklyn, N. Y. (B, C, D)
Ideal Fishing Float Co., Richmond, Va. (A)
Lok-Seal, Inc., New York (C)
Lumelite Corp., Pawling, N. Y. (C)
•Pennsylvania Glass Products Co., Pittsburgh (B, C, D)
Superior Plastics, Inc., Chicago (C)
West Co., Phoenixville, Pa. (D)

STRAPPING

A. Paper
B. Rayon
C. Steel

Editorial information, Div. V Sec. 17

•Acme Steel Co., Chicago (C)
Allegheny Steel Band Co., Pittsburgh (C)
•American Viscose Corp., Philadelphia (B)
Appalachian Steel Corp., Lyndhurst, N. J. (C)
General Strapping Corp., New York (C)
Gerrard, A. J., & Co., Des Plaines, Ill. (C)
Inland Wire Products Co., Crawfordsville, Ind. (C)
Mid-States Steel & Wire Co., Crawfordsville, Ind. (C)
Nakai Shoten, Ltd., Tokyo, Japan (A)
Republic Steel Corp., Cleveland (C)
Signode Steel Strapping Co., Chicago (C)
Stanley Steel Strapping, Div. The Stanley Works, New Britain, Conn. (C)
U. S. Steel Supply Div., United States Steel Corp., Chicago (C)

STRING, PRINTED

(Plain & Decorative)

Editorial information, Div. IV Sec. 15

Academy Ribbon Mills, Burbank, Calif.
Arbetter Ribbon & Mfg. Co., Chicago
Chicago Printed String Co., Chicago
Dekcraft Corp., Syosset, N. Y.
General Printed String Co., Milwaukee

TAGS

Editorial information, Div. IV Sec. 16

Ackermann, G. A., Printing Co., Cicero, Ill.
Acme Tag Co., Minneapolis
•Allen Hollander Co., New York
•American Tag Co., Belleville, N. J.
Arkay Printing Co., New York
Artistic Mfg. Co., Div. Sun Chemical Corp., Stamford, Conn.
Attleboro Printing & Embossing Co., Attleboro, Mass.
Burton Packaging Co., Brooklyn, N. Y.
•Cameo Die & Label Co., New York
Denney-Reyburn Co., W. Chester, Pa.
•Dennison Mfg. Co., Framingham, Mass.
Diamond Printing & Label Corp., Philadelphia
Dickinson, John, & Co., Hemel Hempstead, Herts., England
Eureka Specialty Printing Co., Scranton, Pa.
Fairbairn Co., San Francisco
Fox, C. J., Co., Providence, R. I.
Foxon Co., Providence, R. I.
General Trade Mark Co., New York
Germain's, Inc., Los Angeles
•Jackmeyer Corp., New York
Kimball, A., Co., Brooklyn, N. Y.
•Monarch Marking System Co., Dayton, Ohio
•National Tag Co., Dayton, Ohio
Normandie Press, Inc., New York
Package Products Co., Charlotte, N. C.
Packaging Pioneers, Inc., Tuckahoe, N. Y.
Pannier Corp., Pittsburgh
Papercraft Corp., Pittsburgh
•Riegel Paper Corp., New York
Robinson Tag & Label Co., New York
Rothchild Printing Co., New York
St. Regis Paper Co., New York
Smith, Howard, Paper Mills Ltd., Montreal, Que.
Soabar Co., Philadelphia
Spielman Co., Philadelphia
•Standard Packaging Corp., Allegheny-Fuller Div., Pittsburgh
Steigerwald, A. M., Co., Chicago
•Stoffel Seals Corp., Tuckahoe, N. Y.

Stone Container Corp., Chicago
Sun Chemical Corp., New York
Talmadge Printing Co., New York
Weber Marking Systems, Inc., Mount Prospect, Ill.
Zuckerman, Joseph, Inc., Yonkers, N. Y.

TAPE

A. Cotton
B. Gummed, Plain
C. Heat Sealing
D. Pressure-Sensitive (Self-Sealing)
E. Reinforced
F. Water-Resistant

Editorial information, Div. I Sec. 5

Academy Ribbon Mills, Burbank, Calif. (A)
Adhesive Products, Inc., Albany, Calif. (B, C)
Adhesive Tape Corp., Brooklyn, N.Y. (D)
•Allen Hollander Co., New York (B, C, D)
American "Pres-Stix" Tape Co., Detroit (A, D, E, F)
American Sisalkraft Corp., Attleboro, Mass. (E)
Arno Adhesive Tapes, Inc., Michigan City, Ind. (D, E, F)
Atlantic Gummed Paper Corp., Brooklyn, N. Y. (B, E)
Behr-Manning Co., Troy, N. Y. (D, E, F)
Bemis Bro. Bag Co., St. Louis, Mo. (C, D)
Brady, W. H., Co., Milwaukee (D)
Bro-Dart Industries, Newark, N. J. (D)
•Brown-Bridge Mills, Inc., Troy, Ohio (B, C, E)
Buser, Inc., Paterson, N. J. (A)
Callanan, J. A., Co., Chicago (C, D)
Canadian Technical Tape Ltd., Montreal, Que. (A, C, D, E, F)
Carry-Pack Co., Schiller Park, Ill. (B)
Central States Paper & Bag Co., St. Louis, Mo. (B)
Chicago Printed String Co., Chicago (A)
Connecticut Hard Rubber Co., New Haven, Conn. (D, E, F)
•Dennison Mfg. Co., Framingham, Mass. (C, D)
Devon Tape Corp., Mt. Vernon, N. Y. (D, E, F)
Dickinson, John, & Co., Hemel Hempstead, Herts., England (B, C, D, E, F)
•Dyna-Foam Div., Sun Chemical Corp., Ellenville, N. Y. (F)
Emerson Labeltape & Supply Corp., Brooklyn, N. Y. (D)
Eureka Specialty Printing Co., Scranton, Pa. (D)
Facile Corp., Sub. Sun Chemical Corp., Paterson, N. J. (E)
Fairbairn Co., San Francisco (C, D)
Fasson Products, Div. Avery Adhesive Products, Inc., Painesville, Ohio (D)
Flexible Tape & Label Co., Memphis, Tenn. (D)
General Gummed Products, Inc., Linden, N. J. (B, E)
General Printed String Co., Milwaukee (A)
Gering Plastics, Kenilworth, N. J. (D)
Gerrard, A. J., & Co., Des Plaines, Ill. (D, E)
Gilman Paper Co., New York (B, E)
Gordon-Lacey Chemical Products Co., Maspeth, N. Y. (C)
Gummed Products Co., Div. St. Regis Paper Co., Troy, Ohio (B, E, F)
Gummed Tape & Devices Co., Brooklyn, N. Y. (B, D, E, F)
Hampton Mfg. Co., Industrial Tape Div., New Rochelle, N. Y. (D, F)
Ideal Tape, Inc., Lowell, Mass. (D, E)
Interchemical Corp., Finishes Div., Newark, N. J. (D, E)
Johns-Manville, New York (D, E, F)
Kendall Co., Polyken Sales Div., Chicago (D, F)
Keystone Packaging Service, Inc., Phillipsburg, N. J. (A, B, C)
Kleen-Stik Products, Inc., Chicago (D)
•Knowlton, M. D., Co., Rochester, N. Y. (B, C)
Labelon Corp., Canandaigua, N. Y. (C, D, F)
Leedpak, Inc., New York (C)
Linear Products, Inc., New York (D, E, F)
•Ludlow Corp., Needham Heights, Mass. (A, B, C, D, E, F)
M & Q Plastic Products, Freehold, N. J. (D)
Melrose Packaging Corp., Flushing, N. Y. (D)
Mid-States Gummed Paper Div., Minnesota Mining & Mfg. Co., Bedford Park, Ill. (B, C, D, E, F)
•Milprint, Inc., Milwaukee (D)
Minnesota Mining & Mfg. Co., St. Paul, Minn. (B, D, E, F)
Monomelt Co., Minneapolis (C, D)
Morgan Adhesives Co., Stow, Ohio (D)
Mystik Adhesive Products, Inc., Chicago (A, D, E, F)
•Nashua Corp., Nashua, N. H. (B, C, E)
Nordisk Plaster Industri A/S, Copenhagen, Denmark (D)
Orchard Paper Co., St. Louis, Mo. (C)
Papercraft Corp., Pittsburgh (D)
Paramount Paper Products Co., Omaha, Neb. (D, E)
Permacel, New Brunswick, N. J. (C, D, E, F)
Presto Adhesive Paper Co., Glendale, Calif. (D)
Print-Craft of Houston, Houston, Texas (D)
Protexall Permanent Process Service, Kansas City, Mo. (C, D)
Ralston, W., & Co. (Canada), Montreal, Que. (D, E, F)
Rexford Paper Co., Milwaukee (A, B, C, E, F)
St. Regis Paper Co., New York (B, C, D, E)
Salem Label Co., Salem, Ohio (D)
Shore Line Industries, Inc., Clinton, Conn. (D)
Smith, Howard, Paper Mills Ltd., Montreal, Que. (B, E)
Tape, Inc., Green Bay, Wis. (B, E)
Technical Tape Corp., New Rochelle, N. Y. (D, E, F)
Thomas Stationery Mfg. Co., Springfield, Ohio (B, E)
Topflight Corp., York, Pa. (D, E, F)
Transparent Products Co., New York (D)
Tripp Tape, Inc., Skokie, Ill. (D)
Union Bag-Camp Paper Corp., New York (B, E, F)
United States Rubber Co., New York (A, D)
U. S. Tape Corp., St. Louis, Mo. (D)
Vernon Chemical & Mfg. Corp., New York (A, C, D, E, F)
Visking Corp., Plastic Films, Div. Union Carbide Corp., Chicago (D, F)
Warren Wire Co., Pownal, Vt. (C)
York Label Corp., York, Pa. (D)

TAPE, NON-STICKING

(See Coatings & Tapes, Special)

TINPLATE

Editorial information, Div. II Sec. 9

Appalachian Steel Corp., Lyndhurst, N. J.
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Pittsburgh
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, Ohio

TUBING, EXTRUDED PLASTIC

Editorial information, Div. I Sec. 4, Div. II Sec. 8, 11

Acme Cellophane Converting Corp., Temple City, Calif.
American Cellophane & Plastic Films Corp., Boston
American Pyroxylin Corp., Arlington, N. J.
•Anchor Plastics Co., Long Island City, N. Y.
Andmar Plastic Co., Clifton, N. J.
Blossom Mfg. Co., Brooklyn, N. Y.
Bonny Mfg. Co., Maynard, Mass.
Borden Chemical Co., New York
Chase Bag Co., New York
Colorite Plastics, Inc., Paterson, N. J.
Container Corp. of America, Chicago
•Contour Extrusion Co., Mamaroneck, N. Y.
Dale, John, Ltd., London, England
Davidson Products Co., Seattle, Wash.
•Davis, Joseph, Plastics Co., Kearny, N. J.
•Extruded Plastics, Inc., Norwalk, Conn.
Fabri-Kal Corp., Kalamazoo, Mich.
Firestone Plastics Co., Div. Firestone Tire & Rubber Co., Pottstown, Pa.
•Flex-O-Glass, Inc., Chicago
Food Film, Inc., Pine Brook, N. J.
Frank Plastics Corp., Detroit
Gering Plastics, Kenilworth, N. J.
Goodrich, B. F., Industrial Products Co., Akron, Ohio
•Goodyear Tire & Rubber Co., Akron, Ohio
Holland Insulated Wire & Cable Works Ltd., Amsterdam, Holland
Hydrawlik Co., Roselle, N. J.
•Imco Container Co., Kansas City, Mo.
Jessall Plastics, Div. Electric Storage Battery Co., Kensington, Conn.
Kalle A. G., Wiesbaden, Germany
Keystone Packaging Service, Inc., Phillipsburg, N. J.
•Kordite Co., Div. National Distillers & Chemical Corp., Macedon, N. Y.
Lacollonge-Flexone, Paris, France
M & Q Plastic Products, Freehold, N. J.
Marken Plastic Corp., Los Angeles
•Mehl Mfg. Co., Cincinnati
New England Tape Co., Hudson, Mass.
New York Packaging Corp., Brooklyn, N. Y.
Plastic Extrusion & Engineering Co., Westboro, Mass.
•Plastic Packaging Co., Chicago
Plasti-Form, Inc., Phillipsburg, N. J.
Poly Plastic Products, Inc., Paterson, N.J.
•Queen Transparent Specialties Co., Chicago
Ralston, W., & Co. (Canada), Montreal, Que.
Reliance Plastic & Chemical Corp., Paterson, N. J.
Shore Line Industries, Inc., Clinton, Conn.
Southern Plastics Co., Columbia, S. C.
Superior Plastics, Inc., Chicago
Texas Plastics, Inc., Elsa, Texas
Thatcher Glass Mfg. Co., Plastic Container Div., New York
Thermoplastic Processes, Inc., Stirling, N. J.
Tubophane S.A., Paris, France
Union Carbide International Co., Div. Union Carbide Corp., Plastics Dept., New York
United States Rubber Co., New York
Vacuum Plastics Corp., Columbus, Ohio
Vernon Chemical & Mfg. Corp., New York
Westlake Plastics Co., Lenni Mills, Pa.
World Plastics, New York

VALVES, AEROSOL

Editorial information, Div. II Sec. 11

Dairy Whipt Div., Aerated Container Corp., Chicago
Emson Research, Inc., Bridgeport, Conn.
Marken Plastic Co., Los Angeles
Oel, Inc., Elizabeth, N. J.
•Precision Valve Corp., Yonkers, N. Y.
•Risdon Mfg. Co., Naugatuck, Conn.
Schrader's, A., Son, Div. Scovill Mfg., Inc., Brooklyn, N. Y.

VARNISHES & LACQUERS

(See Coatings, Protective, Permanent, Bonding)

WAX, COATING, LAMINATING, SEALING

Editorial information, Div. I Sec. 3, 4

•Adcote Chemicals, Inc., Elk Grove, Ill.
Bareco Wax Co., Div. Petrolite Corp., Tulsa, Okla.
•Boler Petroleum Co., Ardmore, Pa.
Commerce Chemical Corp., New York
Cooper, D. C., Co., Chicago
•Dennison Mfg. Co., Framingham, Mass.
Dreyfus, L. A., Co., So. Plainfield, N. J.
Glyco Chemicals, Div. Chas. L. Huisking & Co., New York
Hamburger Mineralol-Werke Ernst Jung, Hamburg, Germany
International Wax Refining Co., Valley Stream, N. Y.
Leedpak, Inc., New York
Marvellum Co., Holyoke, Mass.
Pennsylvania Industrial Chemical Corp., Clairton, Pa.
Petroleum Specialties, Inc., New York
Pyroxylin Products, Inc., Chicago
Socony Mobil Oil Co., New York
Sonneborn Chemical & Refining Corp., New York
Standard Insulation Co., E. Rutherford, N. J.
Virginia Chemical Corp., Lynchburg, Va.

WIRE

A. Stapling
B. Stitching

Editorial information, Div. III Sec. 13

•Acme Steel Co., Chicago (B)
Appalachian Steel Corp., Lyndhurst, N. J. (A, B)
Automation Fastening Co., Cleveland (A, B)
Bates Mfg. Co., W. Orange, N. J. (A, B)
Bethlehem Steel Co., Bethlehem, Pa. (A, B)
•Bostitch, Inc., E. Greenwich, R. I. (A, B)
Chicago Steel & Wire Co., Chicago (A, B)
Continental Steel Corp., Kokomo, Ind. (A, B)
Ideal Stitcher Co., Div. W. R. Pabich Mfg. Co., Chicago (A, B)
Inland Wire Products Co., Crawfordsville, Ind. (A, B)
International Staple & Machine Co., Herrin, Ill. (A)
Jones & Laughlin Steel Corp., Pittsburgh (A, B)
Mid-States Steel & Wire Co., Crawfordsville, Ind., (A, B)
Porter, H. K., Co., Riverside-Alloy Metal Div., Riverside, N. J. (A, B)
Wilson Steel & Wire Co., Chicago (A, B)

DISTRIBUTORS, JOBBERS & SALES AGENTS

(The following sell various Materials & Supplies in a wide quantity range.)

Abana Products, Inc., Chicago
Air-Lite Products, Inc., Cambridge, Mass.
Alert Paper Products Co., Brooklyn, N. Y.
Alliance Paper & Packaging Co., New Hyde Park, N. Y.
Allied Commodities Co., Minneapolis
Allpak Co., Chicago
American Carton Wrapper Co., Chicago
American Cordage & Paper Corp., New York
Anderson, R. P., Co., Dallas, Texas
Ansell, S. H., & Son, Inc., Boston
Bel-Art Products, Pequannock, N. J.
Berk, O., Co., Newark, N. J.
Blake, Moffit & Towne, San Francisco
Blank, Arthur, Co., Boston
Bonder Glass & Closure Co., Brooklyn, N. Y.
Bosworth & Co., Cincinnati
Bracamonte, R. M., & Co., San Francisco
Bradford, W. J., Paper Co., Chicago
Bradner Smith & Co., Chicago
Bristol Paper Products, Inc., Long Island City, N. Y.
Broadstreet Paper & Packaging Supply, Boston
Bro-Dart Industries, Newark, N. J.
COSECO, Los Angeles
Cadillac Plastic & Chemical Co., Detroit
Cadillac Products, Inc., Warren, Mich.
Central States Paper & Bag Co., St. Louis, Mo.
Chelsea Bottle Co., Chelsea, Mass.
Chicago Paper Co., Chicago
Cincinnati Container Co., Cincinnati
Codd Paper Co., New York
Collison Lee & Philippi, Inc., Cincinnati
Commercial Plastics & Supply Corp., New York
Cooper, D. C., Co., Chicago
Crystal-X Corp., Lenni Mills, Pa.
Emmer Glass Corp., Miami, Fla.
Exeter Paper Co., Chicago
Feldman Glass Co., New Haven, Conn.
Fleetwood Paper Co., Chicago
Fleischer Paper Co., Los Angeles
Gates, N. T., Co., Pennsauken, N. J.
General Staple Co., New York
Ginsburg Brothers, Inc., Somerville, Mass.
Goldmark Plastic Compounds, Inc., Long Island City, N. Y.
Gould, Stephen, Paper Co., Bayonne, N. J.
Halsell Brokerage Co., Denver, Colo.
Hartung, A. & Co., Philadelphia
Hewitt, C. B. & Bros., Inc. New York
Highland Supply Corp., Highland, Ill.
House of More, San Francisco
Hurwich, R., Co., Berkeley, Calif.
Industrial Plastics Supply Div., Industrial Safety Supply Co., W. Hartford, Conn.
Inland Paper Products Corp., New York
Inland Wire Products Co., Crawfordsville, Ind.
Inlander Steindler Paper Co., Chicago
Interplastics Corp., Jackson Heights, N. Y.
Ison Co., Atlanta, Ga.
Jack, Vern, & Associates, Willoughby, Ohio
Kirchheimer Brothers Co., Chicago
Leedpak, Inc., New York
Levine, Theodore R., & Sons, Paterson, N. J.
Lucas Sales Co., Oklahoma City, Okla.
Lyle, Edgar, Packaging Co., Hamden, Conn.
•MfP Div., Avery Industries, Inc., San Mateo, Calif.
Marks, Edward M., Co., Los Angeles
Marquardt & Co., New York
McMackin, Hugh J., Co., Boston
Millar, Geo. W., & Co., New York
Miller-Lenfesty Supply Co., Tampa, Fla.
Monroe-Danford & Co., Weehawken, N. J.
Murnane Paper Co., Northlake, Ill.
Muro Plastics Co., Seattle, Wash.
Muskegon Marking Equipment Co., Packaging Supplies Div., Muskegon, Mich.
Nash-Hammond, Inc., El Monte, Calif.
Nebel Paper Products Co., Charlotte, N. C.
Oakland Paper Box Co., Emeryville, Calif.
Odman, Irving L., Co., Chicago
Omni Products Corp., New York
Packageers Co., Chicago
Packaging & Converting Co., Washington, D. C.
Packaging Pioneers, Inc., Tuckahoe, N. Y.
Packaging Products & Design Corp., Newark, N. J
Palmer Supplies Co. of Florida, Miami Springs, Fla.
Paper Corp. of United States, New York
Peavey, Lynn, Co., Overland Park, Kan.
Penn Bottle & Supply Co., Philadelphia
Phin Sales Co., Toronto, Ont.
Pickwick Papers, Inc., New York
Ponten, Jean S., Co., Oakland, Calif.
Poris, Harry, Co., New York
Posner, S., Sons, Inc., Brooklyn, N. Y.
Post, Herbert A., Inc., Long Island City, N. Y.
Quality Packaging Supply Corp., Englewood, N. J.
Queen City Paper Co., Cincinnati
Quimby-Walstrom Paper Co., Grand Rapids, Mich.
Rabinowitz, J., & Sons, Inc., Brooklyn, N. Y.
Resnick, L., & Sons, Philadelphia
Richmond Paper Co., Highland, Calif.
Riekes Equipment Co., Omaha, Neb.
Robertson Co., Jamaica, N. Y.
Robins, A. K., Co., Baltimore, Md.
Rodgers Packaging, New York
Rosedale, T., New York
Sager Bros., New York
Salwen, Joe, Paper Products Corp., Brooklyn, N. Y.
Salwen Paper Co., Brooklyn, N. Y.
Schroeder, Arthur, Paper Co., New York
Service Engineers, Inc., Fort Worth, Texas
Shadur Box Co., Milwaukee
Southern Industry Sales Co., Arlington, Texas
Southern Paper Co., New Orleans, La.
Sovereign Paper Corp., Suffern, N. Y.
Spec-Fab Co., Riverton, N. J.
Spring Supply, Inc., Portland, Ore.
Sternberger, Milton, Co., Memphis, Tenn.
Stewart, H. R., Enterprises, Bryn Mawr, Pa.
Strauss, H. B., Corp., New York
Successful Products, Inc., Brooklyn, N. Y.
Timely Packaging Associates, New York
Transilwrap Co., Chicago
Tuttle Press Co., Appleton, Wis.
Twinpack Ltd., Lachine, Que.
Union Transbag Co., Providence, R. I.
Vickers, Charles D., & Co., La Grange, Ill.
Visible Package Sales Corp., Chicago
Ward & Douglass, Chatham, N. J.
Wildon Industries, Inc., New York
Wilson, J. W., Glass Co., Brooklyn, N. Y.
Workman-Powell, Inc., Freeport, N. Y.
Zellerbach Paper Co., San Francisco

Container Suppliers Section

AEROSOLS

(See Containers, Aerosol)

AMPULS, GLASS

Editorial information, Div. II Sec. 10

Braun, W., Co., Chicago
•Erno Products Co., Philadelphia
Murray Glass, Inc., Newark, N. J.
•Owens-Illinois Glass Co., Toledo, Ohio
Wheaton Glass Co., Millville, N. J.

BAGS

(See also Envelopes)

BAGS, ANTI-TARNISH

(Cloth & Cotton-Lined Paper)

Editorial information, Div. II Sec. 7

Bemis Bro. Bag Co., St. Louis, Mo.
Bennett Products, Inc., Rockford, Ill.
•Cottonluxe Mfg. Co., New York
Empire Specialties, Inc., Brooklyn, N. Y.
Glenfab Bag & Liner Co., Glens Falls, N. Y.
Kennedy Car Liner & Bag Co., Shelbyville, Ind.
Mautner Co., New York
Melrose Packaging Corp., Flushing, N. Y.
Orchard Paper Co., St. Louis, Mo.
Stearns & Foster Co., Cincinnati

BAGS, DUPLEX

Editorial information, Div. II Sec. 7, Div. V Sec. 17

Acme Cellophane Converting Corp., Temple City, Calif.
•American Bag & Paper Corp., Philadelphia
Arkell Safety Bag Co., New York
Arkell & Smiths, Hudson Falls, N. Y.
Atlantic Coffee Bag Co., Brooklyn, N. Y.
Bagcraft Corp. of America, Chicago
Bagphane Corp., Flushing, N. Y.
Beacon Paper Bag Co., E. Paterson, N. J.
Bellen Co., Chicago
Bemis Bro. Bag Co., St. Louis, Mo.
Boyertown Packaging Service Corp., Boyertown, Pa.
COSECO, Los Angeles
Cadillac Products, Inc., Warren, Mich.
Canada Foils, Ltd., Toronto, Ont.
Cello Bag Co., Seattle, Wash.
•Cellu-Craft Products Corp., New Hyde Park, N. Y.
Central States Paper & Bag Co., St. Louis, Mo.
Chase Bag Co., New York
Chicago Carton Co., Div. Waldorf Paper Products Co., Chicago
Colonial Envelope Co., Brooklyn, N. Y.
Columbia Paper Products Corp., Baltimore, Md.
•Continental Can Co., Containerboard & Kraft Paper Div., New York
•Continental Can Co., Flexible Packaging Div., Mt. Vernon, Ohio
Crown Zellerbach Corp., Western-Waxide Div., San Leandro, Calif.
Crystal Tube Corp., Chicago
Custom-Made Paper Bag Co., Long Island City, N. Y.
Dixie Wax Paper Co., Dallas, Texas
Dura-Lee Corp., Kansas City, Kan.
Equitable Paper Bag Co., Long Island City, N. Y.
Excelsior Transparent Bag Mfg. Co., Yonkers, N. Y.
Gilman Paper Co., New York
Grafflin Bag Co., Baltimore, Md.
Grand Bag & Paper Co., Hi-Land Paper Products Div., Mt. Vernon, N. Y.
Harley Bag Co., Spartanburg, S. C.
•International Paper Co., New York
Jaite Display Bag Co., Peninsula, Ohio
•Jiffy Mfg. Co., Hillside, N. J.
Kehr Products Co., Willow Grove, Pa.
Kennedy Car Liner & Bag Co., Shelbyville, Ind.
Kirchheimer Brothers Co., Chicago
Kleartone Transparent Products Co., Westbury, N. Y.
•Lassiter, Div. Riegel Paper Corp., New York
Longview Fibre Co., Longview, Wash.
Maine Potato Bag Co., Caribou, Maine
Melrose Packaging Corp., Flushing, N. Y.
Miller, Tompkins & Co., E. Rutherford, N. J.
•Milprint, Inc., Milwaukee
Modern Transparent Mfg. Co., W. Pittston, Pa.
Morgan Bros. Bag Co., Richmond, Va.
Moser Bag & Paper Co., Cleveland
New Jersey Transparent Co., Brooklyn, N. Y.
•Olin, Packaging Div., Forest Products Operations, W. Monroe, La.
•Oneida Paper Products, Inc., Clifton, N. J.
Orchard Paper Co., St. Louis, Mo.
Pacific Process Printing Co., Los Angeles
Packaging Products, Inc., Kansas City, Mo.
Peerless Packages, Inc., Cleveland
Pexco Bag Mfg. Co., Toledo, Ohio
Premier Bag Co., Lyndhurst, N. J.
Premier Packages, Inc., St. Louis, Mo.
Resnick, L., & Sons, Philadelphia
Rex Specialty Bag Corp., Long Island City, N. Y.
Smith, Howard, Paper Mills Ltd., Montreal, Que.
Somerville Ltd., London, Ont.
Speedmaster Packaging Corp., New York
•Standard Packaging Corp., Modern Packages Div., Los Angeles
•Thilmany Pulp & Paper Co., Kaukauna, Wis.
Tower Packaging Co., Wheeling, Ill.
Transparent Bag Co., Seattle, Wash.
Union Bag-Camp Paper Corp., New York
VanPak Products, Inc., Tomah, Wis.
W. E. W. Container Co., Brooklyn, N. Y.
Werthan Bag Corp., Nashville, Tenn.
Wrapture, Inc., Flushing, N. Y.

BAGS, GLASSINE OR WAXED

Editorial information, Div. II Sec. 7

Acme Cellophane Converting Corp., Temple City, Calif.
Arkell & Smiths, Hudson Falls, N. Y.
Atlantic Coffee Bag Co., Brooklyn, N. Y.
Bagcraft Corp. of America, Chicago
Beacon Paper Bag Co., E. Paterson, N. J.
Boyertown Packaging Service Corp., Boyertown, Pa.
Cadillac Products, Inc., Warren, Mich.
Canada Foils, Ltd., Toronto, Ont.
Cello Bag Co., Seattle, Wash.
•Cellu-Craft Products Corp., New Hyde Park, N. Y.
Central States Paper & Bag Co., St. Louis, Mo.
Central Waxed Paper Co., Div. St. Regis Paper Co., Chicago
Chase Bag Co., New York
Colonial Envelope Co., Brooklyn, N. Y.
Columbia Paper Products Corp., Baltimore, Md.
•Continental Can Co., Flexible Packaging Div., Mt. Vernon, Ohio
Crown Zellerbach Corp., Western-Waxide Div., San Leandro, Calif.
Custom-Made Paper Bag Co., Long Island City, N. Y.
Dickinson, John, & Co., Hemel Hempstead, Herts., England
Dixie Wax Paper Co., Dallas, Texas
Equitable Paper Bag Co., Long Island City, N. Y.
Excelsior Transparent Bag Mfg. Co., Yonkers, N. Y.
Glenfab Bag & Liner Co., Glens Falls, N. Y.
Grand Bag & Paper Co., Hi-Land Paper Products Div., Mt. Vernon, N. Y.
Herz Mfg. Div., American Seal-Kap Corp., New York
Jaite Display Bag Co., Peninsula, Ohio
Kehr Products Co., Willow Grove, Pa.
Kennedy Car Liner & Bag Co., Shelbyville, Ind.
Kirchheimer Brothers Co., Chicago
Longview Fibre Co., Longview, Wash.
Melrose Packaging Corp., Flushing, N. Y.
•Milprint, Inc., Milwaukee
Moser Bag & Paper Co., Cleveland
Neostyle, Inc., Birmingham, Mich.
•Nichols Paper Products Co., Green Bay, Wis.
•Oneida Paper Products, Inc., Clifton, N. J.
Orchard Paper Co., St. Louis, Mo.
Packaging Pioneers, Inc., Tuckahoe, N. Y.
Peerless Packages, Inc., Cleveland
Phoenix Products Co., Milwaukee
Rex Specialty Bag Corp., Long Island City, N. Y.
Smith, Howard, Paper Mills Ltd., Montreal, Que.
Southern Paper Co., New Orleans, La.
•Standard Packaging Corp., Modern Packages Div., Los Angeles
•Thilmany Pulp & Paper Co., Kaukauna, Wis.
Tower Packaging Co., Wheeling, Ill.
Unger Co., Cleveland
Union Bag-Camp Paper Corp., New York
•United States Envelope Co., Springfield, Mass.
Werthan Bag Corp., Nashville, Tenn.
Wrapture, Inc., Flushing, N. Y.

BAGS, KRAFT, GROCERY

Editorial information, Div. II Sec. 7

Beacon Paper Bag Co., E. Paterson, N. J.
•Continental Can Co., Containerboard & Kraft Paper Div., New York
Crown Zellerbach Corp., Industrial Paper Sales Div., San Francisco
Dickinson, John, & Co., Hemel Hempstead, Herts., England
Gilman Paper Co., New York
Grand Bag & Paper Co., Hi-Land Paper Products Div., Mt. Vernon, N. Y.
•International Paper Co., New York
Kirchheimer Brothers Co., Chicago
Longview Fibre Co., Longview, Wash.
Moser Bag & Paper Co., Cleveland

•Olin, Packaging Div., Forest Products Operations, W. Monroe, La.
•Owens-Illinois Glass Co., Toledo, Ohio
Smith, Howard, Paper Mills Ltd., Montreal, Que.
Southern Paper Co., New Orleans, La.
Tower Packaging Co., Wheeling, Ill.
Unger Co., Cleveland
Union Bag-Camp Paper Corp., New York
•West Virginia Pulp & Paper Co., New York

BAGS, METAL FOIL

Editorial information, Div. II Sec. 7

Acme Cellophane Converting Corp., Temple City, Calif.
•Aluminum Co. of America, Pittsburgh
Arkell & Smiths, Hudson Falls, N. Y.
Atlantic Coffee Bag Co., Brooklyn, N. Y.
Bagcraft Corp. of America, Chicago
Bagphane Corp., Flushing, N. Y.
Beacon Paper Bag Co., E. Paterson, N. J.
Boyertown Packaging Service Corp., Boyertown, Pa.
Cadillac Products, Inc., Warren, Mich.
Canada Foils, Ltd., Toronto, Ont.
Cello Bag Co., Seattle, Wash.
•Cellu-Craft Products Corp., New Hyde Park, N. Y.
Central States Paper & Bag Co., St. Louis, Mo.
Central Waxed Paper Co., Div. St. Regis Paper Co., Chicago
Chicago Carton Co., Div. Waldorf Paper Products Co., Chicago
Columbia Paper Products Corp., Baltimore, Md.
•Continental Can Co., Flexible Packaging Div., Mt. Vernon, Ohio
Crown Zellerbach Corp., Western-Waxide Div., San Leandro, Calif.
Custom-Made Paper Bag Co., Long Island City, N. Y.
Dickinson, John, & Co., Hemel Hempstead, Herts., England
Durapak Mfg. Co., Baltimore, Md.
Excelsior Transparent Bag Mfg. Co., Yonkers, N. Y.
Grand Bag & Paper Co., Hi-Land Paper Products Div., Mt. Vernon, N. Y.
Hurwich, R., Co., Berkeley, Calif.
Jaite Display Bag Co., Peninsula, Ohio
•Jiffy Mfg. Co., Hillside, N. J.
Kehr Products Co., Willow Grove, Pa.
Kennedy Car Liner & Bag Co., Shelbyville, Ind.
Kirchheimer Brothers Co., Chicago
Kleerpak Mfg. Co., No. Hollywood, Calif.
•Lassiter, Div. Riegel Paper Corp., New York
Melrose Packaging Corp., Flushing, N. Y.
Mil-Jan Bag Co., Muskegon, Mich.
•Milprint, Inc., Milwaukee
•Oneida Paper Products, Inc., Clifton, N. J.
Orchard Paper Co., St. Louis, Mo.
Package Products Co., Charlotte, N. C.
Packaging Pioneers, Inc., Tuckahoe, N. Y.
Protective Coatings Corp., Clifton, N. J.
Quality Packaging Supply Corp., Englewood, N. J.
Rap Industries, Inc., Minneapolis
Rex Specialty Bag Corp., Long Island City, N. Y.
•Reynolds Metals Co., Richmond, Va.
Richmond Paper Co., Highland, Calif.
Robertson Co., Jamaica, N. Y.
Rollprint Products Corp., Chicago
Spec-Fab Co., Riverton, N. J.
Speedmaster Packaging Corp., New York
Unger Co., Cleveland
•United States Envelope Co., Springfield, Mass.
VanPak Products, Inc., Tomah, Wis.
Wrapture, Inc., Flushing, N. Y.

BAGS, OPEN MESH

Editorial information, Div. II Sec. 7, Div. V Sec. 17

Arkell & Smiths, Hudson Falls, N. Y.
Bemis Bro. Bag Co., St. Louis, Mo.
Consolidated Bag Corp., Philadelphia
Hardin Bag & Burlap Co., New Orleans, La.
Morgan Bros. Bag Co., Richmond, Va.
Premier Bag Co., Lyndhurst, N. J.
St. Regis Paper Co., New York
Standard Bag Co., Houston, Texas

BAGS, PADDED SHIPPING

(See Containers, Insulated)

BAGS, SHIPPING

A. Film, Heavy-Duty
B. Paper, Multiwall Heavy-Duty

Editorial information, Div. V Sec. 17

Acme Cellophane Converting Corp., Temple City, Calif. (A)
Albemarle Paper Mfg. Co., Richmond, Va. (B)
Arkell Safety Bag Co., New York (A, B)
Bancroft Bag Factory, Inc., W. Monroe, La. (B)
Bellen Co., Chicago (A)
Bemis Bro. Bag Co., St. Louis, Mo. (A, B)
Boise Cascade Corp., Multiwall Bag Operations, Ames Harris Neville Co., Berkeley, Calif. (B)
COSECO, Los Angeles (A)
Cello Bag Co., Seattle, Wash. (A)
Cello-Pack, Inc., Buffalo, N. Y. (A)
Central States Paper & Bag Co., St. Louis, Mo. (A)
Chase Bag Co., New York (A, B)
Chippewa Plastics Co., Div. Rexall Drug & Chemical Co., Chippewa Falls, Wis. (A)
Consolidated Bag Corp., Philadelphia (A, B)
•Continental Can Co., Containerboard & Kraft Paper Div., New York (B)
•Continental Can Co., Flexible Packaging Div., Mt. Vernon, Ohio (A)
•Cromwell Paper Co., Chicago (B)
Crown Zellerbach Corp., Multiwall Bag Sales Div., San Francisco (B)
Crystal-X Corp., Lenni Mills, Pa. (A)
Durapak Mfg. Co., Baltimore, Md. (A)
Equitable Paper Bag Co., Long Island City, N. Y. (A, B)
Flexicraft Industries, Inc., New York (A)
General Films, Inc., Covington, Ohio (A)
Gering Plastics, Kenilworth, N. J. (A)
Gilman Paper Co., New York (B)
Glenfab Bag & Liner Co., Glens Falls, N. Y. (A)
Harley Bag Co., Spartanburg, S. C. (B)
Heidi Plastics Corp., Yonkers, N. Y. (A)
•International Paper Co., New York (B)
Kennedy Car Liner & Bag Co., Shelbyville, Ind. (A, B)
Keystone Packaging Service, Inc., Phillipsburg, N. J. (A)
•Kordite Co., Div. National Distillers & Chemical Corp., Macedon, N. Y. (A)
Lamex, Inc., Norcross, Ga. (A)
Lion Packaging Products Co., Hicksville, N. Y. (A)
Maine Potato Bag Co., Caribou, Me. (B)
•Mehl Mfg. Co., Cincinnati (A)
Melrose Packaging Corp., Flushing, N. Y. (B)
Miller, Tompkins & Co., E. Rutherford, N. J. (B)
Morgan Bros. Bag Co., Richmond, Va. (A, B)
Myron Mfg. Corp., Englewood, N. J. (A)
New York Packaging Corp., Brooklyn, N. Y. (A)
•Nichols Paper Products Co., Green Bay, Wis. (B)
•Northland Bag Corp., Yonkers, N. Y. (A)
•Olin, Packaging Div., Forest Products Operations, W. Monroe, La. (B)
•Owens-Illinois Glass Co., Toledo, Ohio (B)
Packaging Products & Design Corp., Newark, N. J. (A)
Pexco Bag Mfg. Co., Toledo, Ohio (A)
•Plastic Packaging Co., Chicago (A)
Poly Plastic Products, Inc., Paterson, N. J. (A)
Polyfab Co., Los Angeles (A)
Polyflex Bag & Container, Inc., Johnstown, N. Y. (A)
Premier Bag Co., Lyndhurst, N. J. (B)
Prepac, Inc., New York (A)
•Protective Lining Corp., Brooklyn, N. Y. (A)
•Queen Transparent Specialties Co., Chicago (A)
Raymond Bag Corp., Div. Albemarle Paper Mfg. Co., Middletown, Ohio (A, B)
Reliance Plastic & Chemical Corp., Paterson, N. J. (A)
Richmond Paper Co., Highland, Calif. (A)
St. Regis Paper Co., New York (B)
Sealcraft Products Corp., Milwaukee (A)
Sherman Paper Products Corp., Div. St. Regis Paper Co., Newton Upper Falls, Mass. (B)
Shore Line Industries, Inc., Clinton, Conn. (A)
Speedmaster Packaging Corp., New York (A)
Standard Bag Co., Houston, Texas (B)
•Standard Packaging Corp., Modern Packages Div., Los Angeles (A)
Swartz Mfg. Co., Dorchester, Mass. (A)
Texas Plastics, Inc., Elsa, Texas (A)
Tower Packaging Co., Wheeling, Ill. (A)
Trans Flex Packagers, Unionville, Conn. (A)
Transparent Bag Co., Seattle, Wash. (A)
Union Bag-Camp Paper Corp., New York (B)
VanPak Products, Inc., Tomah, Wis. (A)
Virginia-Carolina Chemical Corp., Bag Div., Richmond, Va. (B)
Werthan Bag Corp., Nashville, Tenn. (B)
•West Virginia Pulp & Paper Co., New York (B)
Wrapture, Inc., Flushing, N. Y. (A)

BAGS, TEXTILE

A. Bulk Containers
B. Unit Containers

Editorial information, Div. II Sec. 7, Div. V Sec. 17

American National Bag & Burlap Co., Brooklyn, N. Y. (A, B)
Arkell Safety Bag Co., New York (A, B)
Associated Bag & Apron Co., Chicago (A, B)
Bemis Bro. Bag Co., St. Louis, Mo. (A, B)
Chase Bag Co., New York (A, B)
Consolidated Bag Corp., Philadelphia (A, B)
•Continental Can Co., Flexible Packaging Div., Mt. Vernon, Ohio (B)
•Cottonluxe Mfg. Co., New York (B)
Crystal Tube Corp., Chicago (B)
Feder Industries, Inc., New York (B)
Grafflin Bag Co., Baltimore, Md. (A, B)
Grand Bag & Paper Co., Hi-Land Paper Products Div., Mt. Vernon, N. Y. (B)
Hardin Bag & Burlap Co., New Orleans, La. (A, B)
Harley Bag Co., Spartanburg, S. C. (A, B)

•Kordite Co., Div. National Distillers & Chemical Corp., Macedon, N. Y. (A)
Lion Packaging Products, Inc., Hicksville, N. Y. (A)
Maine Potato Bag Co., Caribou, Me. (A)
Modern Transparent Mfg. Co., W. Pittston, Pa. (A, B)
Morgan Bros. Bag Co., Richmond, Va. (A, B)
•Oneida Paper Products, Inc., Clifton, N. J. (A, B)
Packaging Products & Design Corp., Newark, N. J. (A, B)
Premier Bag Co., Lyndhurst, N. J. (A, B)
St. Regis Paper Co., New York (A, B)
Standard Bag Co., Houston, Texas (A, B)
Werthan Bag Corp., Nashville, Tenn. (A)
Wrapture, Inc., Flushing, N. Y. (A, B)

BAGS, TRANSPARENT FILM

(Plastic & Cellulosic)

Editorial information, Div. II Sec. 7

ABC Cellophane Co., Div. Rapid Container Corp., Brooklyn, N. Y.
Acme Cellophane Converting Corp., Temple City, Calif.
Acme Tag Co., Minneapolis
Aladdin Transparent Packaging Corp., Westbury, N. Y.
American Cellophane & Plastic Films Corp., Boston
American Industries Co., Div. American Shredded Paper Co., Boston
•American Packaging Corp., Cleveland
Arkell & Smiths, Hudson Falls, N. Y.
Artmor Plastics Corp., Cumberland, Md.
Atlanta Film Converting Co., Atlanta, Ga.
Bagcraft Corp. of America, Chicago
Bagphane Corp., Flushing, N. Y.
Beacon Paper Bag Co., E. Paterson, N. J.
Bellen Co., Chicago
Bemis Bro. Bag Co., St. Louis, Mo.
Better Containers Mfg. Co., Chicago
Blossom Mfg. Co., Brooklyn, N. Y.
Boyertown Packaging Service Corp., Boyertown, Pa.
Brooks Paper Co., St. Louis, Mo.
Cadillac Products, Inc., Warren, Mich.
Canada Foils, Ltd., Toronto, Ont.
Canton Containers, Inc., Canton, Ohio
Cello Bag Co., Seattle, Wash.
Cello-Pack, Inc., Buffalo, N. Y.
•Cellu-Craft Products Corp., New Hyde Park, N. Y.
Central States Paper & Bag Co., St. Louis, Mo.
Chase Bag Co., New York
Clear View Bag Co., Carmel, Ind.
Clearco Products Co., New York
Colonial Envelope Co., Brooklyn, N. Y.
Columbia Paper Products Corp., Baltimore, Md.
Consolidated Bag Corp., Philadelphia
•Continental Can Co., Flexible Packaging Div., Mt. Vernon, Ohio
Crown Zellerbach Corp., Western-Waxide Div., San Leandro, Calif.
Crystal Tube Corp., Chicago
Crystal-X Corp., Lenni Mills, Pa.
Custom-Made Paper Bag Co., Long Island City, N. Y.
Daubert Chemical Co., Chicago
Deluxe Packages, Inc., South Gate, Calif.
Diaphane Corp., Philadelphia
Dickinson, John, & Co., Hemel Hempstead, Herts., England
Dura-Lee Corp., Kansas City, Kan.
Durapak Mfg. Co., Baltimore, Md.
Equitable Paper Bag Co., Long Island City, N. Y.
Excelsior Transparent Bag Mfg. Co., Yonkers, N. Y.
Fabricon Products, River Rouge, Mich.
Flexible Packing, Inc., Oceanside, N. Y.
Flexicraft Industries, Inc., New York
General Films, Inc., Covington, Ohio
Gering Plastics, Kenilworth, N. J.
Glenfab Bag & Liner Co., Glens Falls, N. Y.
•Globe Industries, Inc., Philadelphia
Grace, W. R., & Co., Cryovac Div., Cambridge, Mass.
Herz Mfg. Div., American Seal-Kap Corp., New York
Holland Insulated Wire & Cable Works Ltd., Amsterdam, Holland
Holley Plastics Co., Warren, Mich.
House of More, San Francisco
Hurwich, R., Co., Berkeley, Calif.
Jacobson, S. I., Mfg. Co., Chicago
Jaite Display Bag Co., Peninsula, Ohio
Kage Co., Manchester, Conn.
Kehr Products Co., Willow Grove, Pa.
Kellogg Container Div., United States Envelope Co., Springfield, Mass.
Kendall Mfg. Co., Milwaukee
Kennedy Car Liner & Bag Co., Shelbyville, Ind.
Keystone Packaging Service, Inc., Phillipsburg, N. J.
Kleartone Transparent Products Co., Westbury, N. Y.
Kleerpak Mfg. Co., No. Hollywood, Calif.
•Kobi Polyethylene Bag Mfg. Co., Brooklyn, N. Y.
•Kordite Co., Div. National Distillers & Chemical Corp., Macedon, N. Y.
Kuss, R. L., & Co., Findlay, Ohio
Lamex, Inc., Norcross, Ga.
•Lassiter, Div. Riegel Paper Corp., New York
Lion Packaging Products Co., Hicksville, N. Y.
Lucas Sales Co., Oklahoma City, Okla.
M & D Flexographic Printers, Inc., Chicago
Master Packaging, Inc., Tampa, Fla.
•Mehl Mfg. Co., Cincinnati
Melrose Packaging Corp., Flushing, N. Y.
•Milprint, Inc., Milwaukee
Modern Packaging, Inc., Mt. Holly, N. J.
Modern Transparent Mfg. Co., W. Pittston, Pa.
Morgan Bros. Bag Co., Richmond, Va.
Moser Bag & Paper Co., Cleveland
Munson Bag Co., Cleveland
Myron Mfg. Corp., Englewood, N. J.
•Nashua Corp., Nashua, N. H.
Neostyle, Inc., Birmingham, Mich.
New Jersey Transparent Co., Brooklyn, N. Y.
New York Packaging Corp., Brooklyn, N. Y.
•Northland Bag Corp., Yonkers, N. Y.
•Oneida Paper Products, Inc., Clifton, N. J.
Pacific Process Printing Co., Los Angeles
Package Engineers, Inc., Oklahoma City, Okla.
Package Printing Co., W. Springfield, Mass.
Package Products Co., Charlotte, N. C.
Packageers Co., Chicago
Packaging Pioneers, Inc., Tuckahoe, N.Y.
Packaging Products & Design Corp., Newark, N. J.
Packaging Products, Inc., Kansas City, Mo.
Peerless Packages, Inc., Cleveland
Pexco Bag Mfg. Co., Toledo, Ohio
Pioneer Valley Plastics Co., Agawam, Mass.
•Plastic Packaging Co., Chicago
Poly Plastic Products, Inc., Paterson, N. J.
Polycraft Co., Montreal, Que.
Polyfab Co., Los Angeles
Polyflex Bag & Container, Inc., Johnstown, N. Y.
Polypane Packaging Co., San Juan, P. R.
Premier Packages, St. Louis, Mo.
Prepac, Inc., New York
Protective Coatings Corp., Clifton, N. J.
•Protective Lining Corp., Brooklyn, N. Y.
Puritan Packaging Corp., Columbus, Ohio
Quality Packaging Supply Corp., Englewood, N. J.
Quatrum Corp., Chicago
•Queen Transparent Specialties Co., Chicago
Rapid-Pak, Inc., Los Angeles
Rap Industries, Inc., Minneapolis
Reliance Plastic & Chemical Corp., Paterson, N. J.
Resnick, L., & Sons, Philadelphia
Rex Specialty Bag Corp., Long Island City, N. Y.
Richmond Paper Co., Highland, Calif.
•Riegel Paper Corp., New York
Rollprint Products Corp., Chicago
Safelon Corp., Yonkers, N. Y.
Schenker Co., Chicago
Sealcraft Products Corp., Milwaukee
Shore Line Industries, Inc., Clinton, Conn.
Sirco Mfg. Corp., New York
Southern Paper Co., New Orleans, La.
Spec-Fab Co., Riverton, N. J.
Speedmaster Packaging Corp., New York
•Standard Packaging Corp., New York
Sternberger, Milton, Co., Memphis, Tenn.
Swartz Mfg. Co., Dorchester, Mass.
Teepak, Inc., Chicago
Texas Plastics, Inc., Elsa, Texas
Tower Packaging Co., Wheeling, Ill.
Trans Flex Packagers, Inc., Unionville, Conn.
Transparent Bag Co., Seattle, Wash.
Tripp Tape, Inc., Skokie, Ill.
Unger Co., Cleveland
Union Transbag Co., Providence, R. I.
•United States Envelope Co., Springfield, Mass.
VanPak Products, Inc., Tomah, Wis.
Visual Bag, Inc., New York
W. E. W. Container Co., Brooklyn, N. Y.
Webster Industries, Inc., Salem, Mass.
Wrapture, Inc., Flushing, N. Y.

BAGS, WINDOW

Editorial information, Div. II Sec. 7

•American Bag & Paper Corp., Philadelphia
Arkell & Smiths, Hudson Falls, N. Y.
Bagcraft Corp. of America, Chicago
Beacon Paper Bag Co., E. Paterson, N. J.
Bemis Bro. Bag Co., St. Louis, Mo.
Boise Cascade Corp., Multiwall Bag Operations, Ames Harris Neville Co., Berkeley, Calif.
Chase Bag Co., New York
Chicago Carton Co., Div. Waldorf Paper Products Co., Chicago
Colonial Envelope Co., Brooklyn, N. Y.
Consolidated Bag Corp., Philadelphia
•Continental Can Co., Flexible Packaging Div., Mt. Vernon, Ohio
Custom-Made Paper Bag Co., Long Island City, N. Y.
Equitable Paper Bag Co., Long Island City, N. Y.
Excelsior Transparent Bag Mfg. Co., Yonkers, N. Y.
Grand Bag & Paper Co., Hi-Land Paper Products Div., Mt. Vernon, N. Y.
Jaite Display Bag Co., Peninsula, Ohio
Kehr Products Co., Willow Grove, Pa.
Keystone Packaging Service, Inc., Phillipsburg, N. J.
Melrose Packaging Corp., Flushing, N. Y.
•Milprint, Inc., Milwaukee
Moser Bag & Paper Co., Cleveland
New Jersey Transparent Co., Brooklyn, N. Y.
Packaging Pioneers, Inc., Tuckahoe, N.Y.
Peerless Packages, Inc., Cleveland
Rex Specialty Bag Corp., Long Island City, N. Y.
St. Regis Paper Co., New York
Unger Co., Cleveland

Union Bag-Camp Paper Corp., New York
Visual Bag, Inc., New York
W. E. W. Container Co., Brooklyn, N. Y.
Wrapture, Inc., Flushing, N. Y.

BARRELS, WOODEN

A. Slack
B. Tight

Atlas General Industries, New York (B)
Bell, Edwin, Cooperage Co., Pittsburgh (A)
Flakewood, Inc., Portland, Ore. (B)
Gibbs Brothers Cooperage Co., Hot Springs, Ark. (B)
•Greif Brothers Cooperage Corp., Delaware, Ohio (A, B)
Hamlen, J. H., & Son, Inc., Little Rock, Ark. (B)
Joy of California, San Jose, Calif. (B)
Sauer Cooperage Co., Wyandotte, Mich. (A)
Virginia Barrel Div., Greif Bros. Cooperage Corp., Staten Island, N. Y. (A)

BOTTLES, GLASS

A. Beer
B. Beverage
C. Milk
D. Spirits

Editorial information, Div. II Sec. 10

American-Wheaton Glass Corp., Millville, N. J. (A, B, D)
•Anchor Hocking Glass Corp., Lancaster, Ohio (A, B, D)
•Armstrong Cork Co., Lancaster, Pa. (A, B, D)
•Ball Brothers Co., Muncie, Ind. (A, B, D)
Braun, W., Co., Chicago (B, C, D)
Brockway Glass Co., Brockway, Pa. (A, B, D)
Consumers Glass Co., Montreal, Que. (A, B, C, D)
•Continental Can Co., Hazel-Atlas Glass Div., Wheeling, W. Va. (A, B, D)
Dominion Glass Co., Montreal, Que. (A, B, C, D)
Foster-Forbes Glass Co., Marion, Ind. (A, B, D)
Glass Containers Corp., Fullerton, Calif. (A, B, C, D)
Knox Glass, Inc., Knox, Pa. (A, B, C, D)
Liberty Glass Co., Sapulpa, Okla. (B, C, D)
Maryland Glass Corp., Baltimore, Md. (A)
•Metro Glass, Div. National Dairy Products Corp., Jersey City, N. J. (A, B, D)
Northwestern Glass Co., Seattle, Wash. (A, B, C, D)
Obear Nester Glass Co., E. St. Louis, Ill. (A, B, D)
•Owens-Illinois Glass Co., Toledo, Ohio (A, B, C, D)
Pierce Glass Co., Port Allegany, Pa. (B, D)
Thatcher Glass Mfg. Co., New York (A, B, C, D)
Universal Glass Products Co., Parkersburg, W. Va. (A, C, D)

BOTTLES, HAND MADE

Editorial information, Div. II Sec. 10, Div. IV Sec. 15

•Anchor Hocking Glass Corp., Lancaster, Ohio
•Erno Products Co., Philadelphia
•Owens-Illinois Glass Co., Toledo, Ohio
Special Glass Products Co., New York
Wheaton Glass Co., Millville, N. J.

BOTTLES, MINIATURE

Editorial information, Div. II Sec. 10, Div. IV Sec. 15

Alfa Mfg. Co., Chicago
•Anchor Hocking Glass Corp., Lancaster, Ohio
Braun, W., Co., Chicago
Carr-Lowrey Glass Co., Baltimore, Md.
Dominion Glass Co., Montreal, Que.
•Dougherty Brothers, Buena, N. J.
•Erno Products Co., Philadelphia
•Pennsylvania Glass Products Co., Pittsburgh
Plastic Assembled Products, Inc., Baltimore, Md.
Special Glass Products Co., New York

BOTTLES, PLASTIC

A. Flexible or Squeeze-Type
B. Rigid

Editorial information, Div. II Sec. 8

Air Formed Products Corp., Sub. Bemis Bro. Bag Co., Nashua, N. H. (A, B)
Alfa Mfg. Co., Chicago (B)
American Cellular Corp., Miami, Fla. (A, B)
Apcon Co., Independence, Mo. (B)
•Armstrong Cork Co., Lancaster, Pa. (A)
•Ball Brothers Co., Muncie, Ind. (B)
•Bradley Associates, Inc., Chicago (B)
Bradley-Sun Div., American Can Co., Union, N. J. (A)
Braun, W., Co., Chicago (A, B)
Brockway Glass Co., Brockway, Pa. (A)
•Celanese Plastics Co., Div. Celanese Corp. of America, Newark, N. J. (A, B)
•Celluplastics, Inc., Sub. Brockway Glass Co., Newark, N. J. (B)
Chanal Plastics Corp., Rego Park, N. Y. (A)
Container Corp. of America, Chicago (A, B)
•Continental Can Co., Plastic Bottle & Tube Div., Chicago (A, B)
Contour Packaging Co., Philadelphia (A, B)
DeWitt Plastics, Auburn, N. Y. (A, B)
•Dougherty Brothers, Buena, N. J. (B)
Eclipse Plastic Industries, Inc., Sarasota, Fla. (A, B)
•Erno Products Co., Philadelphia (A, B)
Foster Grant Co., Leominster, Mass. (A)
Frank Plastics Corp., Detroit (A, B)
Haveg Industries, Inc., Blow-Molding Div., Bound Brook, N. J. (A, B)
•Hedwin Corp., New York (B)
Howard Plastics Co., Leominster, Mass. (A)
Hydrocarbon Chemicals, Inc., Plastic Div., Keyport, N. J. (A, B)
•Imco Container Co., Kansas City, Mo. (A, B)
K & M Plastic Co., Maywood, Ill. (A, B)
Kenly, Inc., Terre Haute, Ind. (A)
Leedpak, Inc., New York (B)
•Lermer Plastics, Inc., Garwood, N. J. (B)
•Mojonnier, Albert, Inc., Franklin Park, Ill. (B)
North Star Industries, Inc., Minneapolis (A, B)
Olympic Plastics Co., Los Angeles (A, B)
•Owens-Illinois Glass Co., Toledo, Ohio (B)
Plastic Assembled Products, Inc., Baltimore, Md. (A, B)
Plasticite Corp., Bronx, N. Y. (A)
•Plax Corp., Hartford, Conn. (A, B)
Service Engineers, Inc., Fort Worth, Texas (A, B)
Tech Art Plastics Co., Morristown, N. J. (B)
Vacuum Plastics Corp., Columbus, Ohio (B)
Vanguard Plastics, Inc., Freehold, N. J. (B)
Westlake Plastics Co., Lenni Mills, Pa. (B)
Wheaton Plastics Co., Mays Landing, N. J. (A, B)
Whyte Mfg. Co., New York (A, B)
Wilson Plastic Container Corp., Brooklyn, N. Y. (B)
•Wirz, A. H., Inc., Chester, Pa. (A, B)
Zarn, Inc., Reidsville, N. C. (A, B)

BOTTLES, PROPRIETARY & PRESCRIPTION

Editorial information, Div. II Sec. 10

American Cellular Corp., Miami, Fla.
•Anchor Hocking Glass Corp., Lancaster, Ohio
•Armstrong Cork Co., Lancaster, Pa.
•Ball Brothers Co., Muncie, Ind.
Braun, W., Co., Chicago
Brockway Glass Co., Brockway, Pa.
Carr-Lowrey Glass Co., Baltimore, Md.
•Celluplastics, Inc., Sub. Brockway Glass Co., Newark, N. J.
Consumers Glass Co., Montreal, Que.
•Continental Can Co., Hazel-Atlas Glass Div., Wheeling, W. Va.
Dominion Glass Co., Montreal, Que.
Emmer Glass Corp., Miami, Fla.
•Erno Products Co., Philadelphia
Foster-Forbes Glass Co., Marion, Ind.
Glass Containers Corp., Fullerton, Calif.
Glenshaw Glass Co., Glenshaw, Pa.
•Imco Container Co., Kansas City, Mo.
Kerr, Alexander H., & Co., Los Angeles
Knox Glass, Inc., Knox, Pa.
Maryland Glass Corp., Baltimore, Md.
•Metro Glass, Div. National Dairy Products Corp., Jersey City, N. J.
Northwestern Glass Co., Seattle, Wash.
Obear Nester Glass Co., E. St. Louis, Ill.
Olympic Plastics Co., Los Angeles
•Owens-Illinois Glass Co., Toledo, Ohio
•Pennsylvania Glass Products Co., Pittsburgh
Pierce Glass Co., Port Allegany, Pa.
•Plax Corp., Hartford, Conn.
Service Engineers, Inc., Fort Worth, Texas
Wheaton Glass Co., Millville, N. J.
Wilson Plastic Container Corp., Brooklyn, N. Y.
•Wirz, A. H., Inc., Chester, Pa.

BOTTLES, SERUM

Editorial information, Div. II Sec. 10

American Cellular Corp., Miami, Fla.
•Armstrong Cork Co., Lancaster, Pa.
•Ball Brothers Co., Muncie, Ind.
Dominion Glass Co., Montreal, Que.
•Dougherty Brothers, Buena, N. J.
Emmer Glass Corp., Miami, Fla.
•Erno Products Co., Philadelphia
Glass Containers Corp., Fullerton, Calif.
•Imco Container Co., Kansas City, Mo.
Knox Glass, Inc., Knox, Pa.
Obear Nester Glass Co., E. St. Louis, Ill.
•Owens-Illinois Glass Co., Toledo, Ohio
•Pennsylvania Glass Products Co., Pittsburgh
•Plax Corp., Hartford, Conn.
Wheaton Glass Co., Millville, N. J.
•Wirz, A. H., Inc., Chester, Pa.

BOTTLES, TOILET, PERFUME, COSMETIC

Editorial information, Div. II Sec. 10, Div. IV Sec. 15

American Cellular Corp., Miami, Fla.
•Anchor Hocking Glass Corp., Lancaster, Ohio
•Armstrong Cork Co., Lancaster, Pa.
•Ball Brothers Co., Muncie, Ind.
Braun, W., Co., Chicago
Brockway Glass Co., Brockway, Pa.
Carr-Lowrey Glass Co., Baltimore, Md.
Consumers Glass Co., Montreal, Que.
•Continental Can Co., Hazel-Atlas Glass Div., Wheeling, W. Va.
Dominion Glass Co., Montreal, Que.
Emmer Glass Corp., Miami, Fla.
•Emo Products Co., Philadelphia
Foster-Forbes Glass Co., Marion, Ind.
•Frank, Walter, Organization, Hillside, Ill.
Glass Containers Corp., Fullerton, Calif.
Glenshaw Glass Co., Glenshaw, Pa.
•Imco Container Co., Kansas City, Mo.
Knox Glass, Inc., Knox, Pa.
Maryland Glass Corp., Baltimore, Md.
•Metro Glass, Div. National Dairy Products Corp., Jersey City, N. J.
Northwestern Glass Co., Seattle, Wash.
Obear Nester Glass Co., E. St. Louis, Ill.
•Owens-Illinois Glass Co., Toledo, Ohio
Pierce Glass Co., Port Allegany, Pa.
Plastic Assembled Products, Inc., Baltimore, Md.
•Plax Corp., Hartford, Conn.
Special Glass Products Co., New York
Wheaton Glass Co., Millville, N. J.
Wilson Plastic Container Corp., Brooklyn, N. Y.
•Wirz, A. H., Inc., Chester, Pa.

BOXES, CORRUGATED SHIPPING

(See Containers, Corrugated & Solid Fibre)

BOXES, FABRIC OR LEATHERETTE COVERED

A. Metal Base
B. Paper Base
C. Wood Base

Editorial information, Div. IV Sec. 15

Abest Paper Box Co., New York (B, C)
Alsten Co., Jersey City, N. J. (A, B, C)
American Paper Box Co., Montreal, Que. (B)
Arrow Mfg. Co., West New York, N. J. (A, B, C)
Barnett, Samuel, Co., Philadelphia (A, B)
Bechtold, C. B., Co., Philadelphia (B)
Bennett Products Inc., Rockford, Ill. (B)
Bogert & Hopper, Inc., New York (C)
Box Shop, Inc., New Haven, Conn. (B)
Boxcraft Paper Box Co., Oakland, Calif. (B)
Brothers Paper Box Co., Sioux City, Iowa (B)
Bufkor, Inc., Buffalo, N. Y. (A, B, C)
Cambridge Paper Box Co., Cambridge, Mass. (B)
Casco Paper Box Co., Portland, Maine (B)
Central Paper Box Co., Lancaster, Pa. (B)
•Chaspec Mfg. Co., Greenwich, Conn. (A, B, C)
Columbus Paper Box Co., Columbus, Ohio (B)
•Creative Packaging, Inc., Indianapolis (B)
De Luxe Craft Mfg. Co., Chicago (A, B, C)
•Dennison Mfg. Co., Framingham, Mass. (B)
Eagle Paper Box Mfg. Co., Chicago (B)
Farrington Packaging Corp., Needham Heights, Mass. (A, B)
Feder Industries, Inc., New York (B)
Fleming & Sons, Inc., Magnolia Carton Div., Houston, Texas (B)
Grigsby Bros. Paper Box Mfrs., Portland, Ore. (B)
Heminway Corp., Waterbury, Conn. (A, B)
Imperial Paper Box Corp., Brooklyn, N. Y. (B)
Jackson Paper Box Co., Jackson, Mich. (B)
Jones, Jesse, Box Corp., Philadelphia (B)
Jordan Paper Box Co., Chicago (B, C)
Kalamazoo Paper Box Corp., Kalamazoo, Mich. (B, C)
Landau Metal Products Corp., Long Island City, N. Y. (A)
Leominster Paper Box Co., Leominster, Mass. (B)
Levis, John A., & Sons, Inc., Rochester, N. Y. (A, B)
Liberty Paper Box Co., Winona, Minn. (B)
Livingston & Co., New York (B, C)
Manufacturers Box Co., Bridgeport, Conn. (B, C)
Martin, Fair, Boxes, Inc., Concord, N. C. (B)
Mason Box Co., Attleboro Falls, Mass. (B)
Mautner Co., New York (A, B, C)
Mele Packaging Corp., Utica, N. Y. (A, B, C)
Miller, Walter P., Co., Philadelphia (B)
Modern Boxes, Inc., Chicago (B)
Mullery Paper Packages, Inc., St. Paul, Minn. (B)
Noble, F. H., & Co., Chicago (A)
Northwestern Paper Box Co., Seattle, Wash. (B)
Novel Box Co., Brooklyn, N. Y. (A, B)
Planned Displays, Inc., Leominster, Mass. (B)
Prepac, Inc., New York (B)
Promotional Container Co., Newark, N. J. (A, B)
Shaw Paper Box Co., Pawtucket, R. I. (B)
Shaw-Randall Co., Pawtucket, R. I. (B)
Shoup-Owens, Inc., Hoboken, N. J. (B)
Snyder, George H., Inc., Philadelphia (B)
Specialty Paper Box Co., Los Angeles (B)
•Standard Packaging Corp., Bradley & Gilbert Div., Louisville, Ky. (B)
Taylor Box Co., Warren, R. I. (B)
United States Box Co., Brooklyn, N. Y. (B, C)
Universal Folding Box Co., Hoboken, N. J. (B)
Universal Jewelry Case Co., Chicopee, Mass. (B)
Utica Box Co., Utica, N. Y. (B)
Voss, Karl, Corp., Hoboken, N. J. (B)
Warneke Paper Box Co., Denver, Colo. (B)
Weil & Newman, Inc., Brooklyn, N. Y. (B)
Williams Brothers Paper Box Co., St. Joseph, Mich. (B)
Youse, C. J., Co., Baltimore, Md. (B)
Zumbiel, C. W., Co., Cincinnati (B)

BOXES, FANCY WOOD

Editorial information, Div. IV Sec. 15, Div. V Sec. 17

Alsten Co., Jersey City, N. J.
American Box Corp., San Francisco
Autokraft Box Corp., York, Pa.
Braun-Crystal Mfg. Co., Middle Village, N. Y.
•Chaspec Mfg. Co., Greenwich, Conn.
Dunning, J. H., Corp., Darien, Conn.
Estes, E. B., & Sons, New York
Hill Mfg. Co., Lyndonville, Vt.
Jordan Paper Box Co., Chicago
Lea, David M., & Co., Richmond, Va.
Leominster Paper Box Co., Leominster, Mass.
Mautner Co., New York
Nussbaum Novelty Mfg. Co., Berne, Ind.
Planned Displays, Inc., Leominster, Mass.
Seattle Box Co., Seattle, Wash.

BOXES, FOLDING

(See Cartons, Folding)

BOXES, MAILING

Editorial information, Div. II Sec. 6

Abest Paper Box Co., New York
Acme Folding Box Co., Brooklyn, N. Y.
Ainslie Co., Div. Boise Cascade Corp., Spokane, Wash.
American Paper Box Co., Montreal, Que.
Andre Paper Box Co., San Leandro, Calif.
Apex Paper Box Co., Cleveland
Badger Carton Co., Milwaukee
Barnett, Samuel, Co., Philadelphia
Bay Cities Paperbox Co., Oakland, Calif.
Bechtold, C. B., Co., Philadelphia
Box Shop, Inc., New Haven, Conn.
Brooks & Porter, Inc., New York
Brothers Paper Box Co., Sioux City, Iowa
Burton Packaging Co., Brooklyn, N. Y.
Cambridge Paper Box Co., Cambridge, Mass.
Cardinal Boxes, Inc., Philadelphia
Casco Paper Box Co., Portland, Maine
Casselman, T. & E., Inc., New York
Central Paper Box Co., Lancaster, Pa.
Chicago Carton Co., Div. Waldorf Paper Products Co., Chicago
•Cincinnati Box & Partition Co., Cincinnati
Climax Mfg. Co., Castorland, N. Y.
Collett-Sproule Boxes Ltd., Scarborough, Ont.
Columbus Paper Box Co., Columbus, Ohio
Cooper Paper Box Div., Clarkson Press, Inc., Buffalo, N. Y.
•Creative Packaging, Inc., Indianapolis
Crown Paper Box Corp., Indianapolis
Eagle Paper Box Mfg. Co., Chicago
•Erno Products Co., Philadelphia
Essex Paper Box Mfg. Co., Newark, N. J.
Fleming & Sons, Inc., Magnolia Carton Div., Houston, Texas
Flower City Specialty Co., Rochester, N. Y.
Friedel, J. F., Paper Box Co., E. Syracuse, N. Y.
Friend Box Co., Danvers, Mass.
Gardiner Paper Mills, Inc., Gardiner, Maine
Greenfield Paper Box Co., Greenfield, Miss.
Jones, Jesse, Box Corp., Philadelphia
Jordan Paper Box Co., Chicago
Kalamazoo Paper Box Corp., Kalamazoo, Mich.
Kiernan-Hughes Co., Jersey City, N. J.
Levis, John A., & Sons, Inc., Rochester, N. Y.
Lewy, Morris L., & Co., New York
Liberty Paper Box Co., Winona, Minn.
Longview Fibre Co., Longview, Wash.
Manufacturers Box Co., Bridgeport, Conn.
Martin, Fair, Boxes, Inc., Concord, N. C.
Mason Box Co., Attleboro Falls, Mass.
Metal Edge Industries, Barrington, N. J.
Miller, Walter P., Co., Philadelphia
Modern Boxes, Inc., Chicago
Mullery Paper Packages, Inc., St. Paul, Minn.

Nelson, B. F., Mfg. Co., Minneapolis
Newark Paper Box Co., Newark, N. J.
Northwestern Paper Box Co., Seattle, Wash.
•Owens-Illinois Glass Co., Toledo, Ohio
Package & Display Corp., Brooklyn, N. Y.
•Packaging Components, Inc., New York
•Paper Package Co., Div. Creative Packaging, Inc., Indianapolis
Paragon Box Co., Atlanta, Ga.
Pharmacy Paper Box Co., Chicago
Piqua Paper Box Co., Piqua, Ohio
Rhoades Paper Box Corp., Springfield, Ohio
Scott & Daniells, Inc., Portland, Conn.
Shadur Box Co., Milwaukee
Shaw Paper Box Co., Pawtucket, R. I.
Shaw-Randall Co., Pawtucket, R. I.
Snyder, George H., Inc., Philadelphia
Spear Box Co., New York
Specialty Paper Box Co., Los Angeles
Stone Container Corp., Chicago
Taylor Box Co., Warren, R. I.
Toledo Paper Box Co., Toledo, Ohio
United States Box Co., Brooklyn, N. Y.
Universal Folding Box Co., Hoboken, N. J.
Universal Jewelry Case Co., Chicopee, Mass.
Warren-Nicholson Co., Davenport, Iowa
Youse, C. J., Co., Baltimore, Md.
Zumbiel, C. W., Co., Cincinnati

BOXES, METAL EDGE

Editorial information, Div. II Sec. 6

American Paper Box Co., Montreal, Que.
Apex Paper Box Co., Cleveland
Burton Packaging Co., Brooklyn, N. Y.
Chicago Carton Co., Div. Waldorf Paper Products Co., Chicago
•Cincinnati Box & Partition Co., Cincinnati
Collett-Sproule Boxes Ltd., Scarborough, Ont.
Farrington Packaging Corp., Needham Heights, Mass.
Flashfold Box Corp., Fort Wayne, Ind.
Heminway Corp., Waterbury, Conn.
Hollinger Corp., Arlington, Va.
Lansky Die Cutting Corp., Brooklyn, N. Y.
Metal Edge Industries, Barrington, N. J.
Nelson, B. F., Mfg. Co., Minneapolis
Presque Isle Paper Products, Inc., Erie, Pa.
Rhoades Paper Box Corp., Springfield, Ohio
Scott & Daniells, Inc., Portland, Conn.
Southern Special Products, Richmond, Va.

BOXES, METAL LITHOGRAPHED & EMBOSSED

Editorial information, Div. II Sec. 9

•Anchor Hocking Glass Corp., Lancaster, Ohio
Atlantic Can Co., Delawanna, N. J.
Buckeye Stamping Co., Columbus, Ohio
•Burdick & Son, Inc., Albany, N. Y.
Clark, J. L., Mfg. Co., Rockford, Ill.
Clarke Can Co., Philadelphia
•Continental Can Co., Metal Div., New York
Daher Co., Long Island City, N. Y.
Dale, John, Ltd., London, England
Ellisco, Inc., Philadelphia
I. D. Co., New York
Krause, Frederick A., Associates, Inc., Frenchtown, N. J.
Republic Steel Corp., Cleveland
•Sterling Seal Co., Erie, Pa.

BOXES, METAL SPECIALTIES

Editorial information, Div. II Sec. 9, Div. IV Sec. 15

•Anchor Hocking Glass Corp., Lancaster, Ohio
Arrow Mfg. Co., West New York, N. J.
Braun-Crystal Mfg. Co., Middle Village, N. Y.
Buckeye Stamping Co., Columbus, Ohio
Clark, J. L., Mfg. Co., Rockford, Ill.
•Continental Can Co., Metal Div., New York
Ellisco, Inc., Philadelphia
Farrington Packaging Corp., Needham Heights, Mass.
I. D. Co., New York
Krause, Frederick A., Associates, Inc., Frenchtown, N. J.
Landau Metal Products Corp., Long Island City, N. Y.
Production Metal Products Co., Chicago
Scovill Mfg. Co., Waterbury, Conn.
•Sterling Seal Co., Erie, Pa.

BOXES, MOLDED PLASTIC, STOCK

Editorial information, Div. II Sec. 8

Alladin Plastics, Inc., Gardena, Calif.
Alsten Co., Jersey City, N. J.
•Animal Trap Co. of America, Lititz, Pa.
Arrow Mfg. Co., West New York, N. J.
Bopp-Decker Plastics, Inc., Birmingham, Mich.
•Bradley Associates, Inc., Chicago
Braun-Crystal Mfg. Co., Middle Village, N. Y.
Brilhart Plastics Corp., Mineola, N. Y.
Brockway Glass Co., Brockway, Pa.
Bufkor, Inc., Buffalo, N. Y.
Clover Industries, Inc., Tonawanda, N.Y.
Columbia Basin Plastics Co., No. Hollywood, Calif.
Conex Div., Illinois Tool Works, Des Plaines, Ill.
Continental Plastics Corp., Chicago
•Creative Packaging, Inc., Indianapolis
Creative Plastic Containers, Culver City, Calif.
•Dennison Mfg. Co., Framingham, Mass.
Denver Plastics, Inc., Golden, Colo.
DeWitt Plastics, Auburn, N. Y.
•Diamond Plastics Industries, Div. Creative Packaging, Inc., Roanoke, Va.
•Dillon-Beck Mfg. Co., Hillside, N. J.
Duval Industries, Inc., Winthrop, Mass.
Eclipse Plastic Industries, Inc., Sarasota, Fla.
•Erno Products Co., Philadelphia
Farrington Packaging Corp., Needham Heights, Mass.
Flambeau Plastics Corp., Baraboo, Wis.
Garray Plastics, Inc., Kearny, N. J.
Gary Enterprises, Inc., Brooklyn, N. Y.
Gibbs Automatic Moulding Div., Pierce Industries, Inc., Henderson, Ky.
Harkin Affiliates, Inc., New York
Hermsdorf Industries, Inc., Manchester, N. H.
Illinois Plastic Molding & Mfg. Co., Chicago
Injection Molding Corp., New York
Kaufman Hoag Co., New York
Landsberger Plastics Co., New York
Lewis, G. B., Co., Watertown, Wis.
Mautner Co., New York
•Mehl Mfg. Co., Cincinnati
Nalle Plastics, Inc., Austin, Texas
North Star Industries, Inc., Minneapolis
Nosco Plastics, Inc., Erie, Pa.
Novel Box Co., Brooklyn, N. Y.
Oppenheim Co., New York
Pantasote Co., Panta-Pak Div., New York
•Paper Package Co., Div. Creative Packaging, Inc., Indianapolis
Parkway Plastics, Inc., New Market, N. J.
•Plas-Tech, Inc., St. Paul, Minn.
Plastic Packaging Corp., Chicopee, Mass.
Plastican Corp., Butler, N. J.
Plasticon Corp., Minneapolis
Plasti-Pak Containers Ltd., Toronto, Ont.
Plasti-Vue Mfg. Co., Fort Worth, Texas
Plastomatic Corp., Malvern, Pa.
Plast-O-Pak Corp., Leominster, Mass.
Polar Container Corp., Chicago
Polygon Products Co., Chicago
Promotional Container Co., Newark, N. J.
Sealright Co., Fulton, N. Y.
Standard Novelty Box Co., New York
Superior Plastics, Inc., Chicago
Tech Art Plastics Co., Morristown, N. J.
Transparent Specialties Corp., Cleveland
Tri-State Plastic Molding Co., Henderson, Ky.
Tupper Co., Woonsocket, R. I.
Union Specialty Co., Bloomingdale, N. J.
United Progress, Inc., Albany, N. Y.
United States Box Co., Brooklyn, N. Y.
•Vlchek Tool Co., Cleveland
•Weber Plastics, Inc., Stevens Point, Wis.
Whyte Mfg. Co., New York
Wilpet Tool & Mfg. Co., Kearny, N. J.
Wilson Plastics, Inc., Sandusky, Ohio

BOXES, NAILED WOODEN

Editorial information, Div. V Sec. 17

Acme Pallet Co., New York
Allen & Hull, Inc., Rochester, N. H.
American Box Corp., San Francisco
Atlas General Industries, Inc., New York
Autokraft Box Corp., York, Pa.
Bigelow-Garvey Lumber Co., Chicago
Bogert & Hopper, Inc., New York
Carroll Box & Pallet Co., Los Angeles
Chicago Mill & Lumber Co., Chicago
Clinch-Tite Corp., Ardmore, Pa.
Cronk Box Corp., Highland Park, N. J.
Cumberland Box Co., Cumberland, Md.
Davidson, D. H., Mfg. Co., Philadelphia
Dreyer, H. D., Box Co., Baltimore, Md.
Dunning, J. H., Corp., Darien, Conn.
Finneran, Joseph R., Co., Wallington, N. J.
Flour City Box Mfg. Co., Waterloo, Iowa
General Box Co., Des Plaines, Ill.
Gondert & Lienesch, Inc., Dayton, Ohio
Hill & Neumann Co., Jersey City, N. J.
Jones Box & Mill Division, No. Tonawanda, N. Y.
Lea, David M., & Co., Richmond, Va.
Letts Box & Mfg. Co., St. Joseph, Mo.
Marathon Box Co., Wausau, Wis.
Marinette & Menominee Box Co., Marinette, Wis.
Miller Box Co., Tuscaloosa, Ala.
Moraine Box Co., Dayton, Ohio
New England Box Co., Greenfield, Mass.
Packaging & Converting Co., Washington, D. C.
Packing Material Co., Detroit
Pein Box & Lumber Co., Portland, Ore.
Portland Box Co., Portland, Maine
St. Regis Paper Co., New York
Seattle Box Co., Seattle, Wash.
Smeed Box Co., Cleveland
Specialized Packaging Engineering Co., Phoenix, Ariz.
Spring Wood Products, Inc., Geneva, Ohio
Townson, W. D., Lumber Co., Murphy, N. C.
Treen Box Co., Philadelphia
Wall, C. M., & Son, Inc., Lexington, N. C.

Williamsburg Millwork Corp., Bowling Green, Va.
Woodstock Mfg. Co., Charleston, S. C.
Yankie Lumber Co., Harriman, Tenn.
Yardley Box Co., Chicago

BOXES, PAPER SET-UP

Editorial information, Div. II Sec. 6

Abest Paper Box Co., New York
Ainslie Co., Div. Boise Cascade Corp., Spokane, Wash.
Alderman Paper Box Corp., Rochester, N. Y.
American Paper Box Co., Montreal, Que.
Apex Paper Box Co., Cleveland
Armor Box Corp., Newark, N. J.
Autokraft Box Corp., York, Pa.
Barnett, Samuel, Co., Philadelphia
Bay Cities Paperbox Co., Oakland, Calif.
Bechtold, C. B., Co., Philadelphia
Bennett Products, Inc., Rockford, Ill.
Bicknell & Fuller Paper Box Co., Boston
Bock, Frank, New York
Box Shop, Inc., New Haven, Conn.
Boxcraft Paper Box Co., Oakland, Calif.
Brothers Paper Box Co., Sioux City, Iowa
Bufkor, Inc., Buffalo, N. Y.
Burnett, R. L., Co., San Antonio, Texas
Burt, F. N., Co., Buffalo, N. Y.
Cambridge Paper Box Co., Cambridge, Mass.
Cardinal Boxes, Inc., Philadelphia
Casco Paper Box Co., Portland, Maine
Casselman, T. & E., Inc., New York
Central Paper Box Co., Lancaster, Pa.
Central Paper Box Co., Philadelphia
•Chaspec Mfg. Co., Greenwich, Conn.
Chicago Paper Box Co., Chicago
Collett-Sproule Boxes Ltd., Scarborough, Ont.
Color Reproductions, Inc., Union, N. J.
Columbus Paper Box Co., Columbus, Ohio
Consolidated Box Co., Tampa, Fla.
Consolidated Paper Box Co., Somerville, Mass.
Container Corp. of America, Chicago
•Creative Packaging, Inc., Indianapolis
Crown Paper Box Corp., Indianapolis
Davis, S. H., Paper Box Co., Toledo, Ohio
Deline, I. A., Paper Boxes, Inc., Denver, Colo.
•Dennison Mfg. Co., Framingham, Mass.
Eagle Paper Box Mfg. Co., Chicago
Essex Paper Box Mfg. Co., Newark, N. J.
Feder Industries, Inc., New York
•Fibreboard Paper Products Corp., San Francisco
Field Container Corp., Elk Grove Village, Ill.
Fleming & Sons, Inc., Magnolia Carton Div., Houston, Texas
Flower City Specialty Co., Rochester, N. Y.
•Foils Packaging Corp., Cincinnati
Forsberg Paper Box Co., Madison, Wis.
Friedel, J. F., Paper Box Co., E. Syracuse, N. Y.
Friend Box Co., Danvers, Mass.
Gardiner Paper Mills, Inc., Gardiner, Maine
Gerbereux, Dufft & Kinder, Brooklyn, N. Y.
Gift Box Corp. of America, New York
Gigante Paper Box Corp., Jersey City, N. J.
Greenfield Paper Box Co., Greenfield, Mass.
Grigsby Bros. Paper Box Mfrs., Portland, Ore.
Heminway Corp., Waterbury, Conn.
Hope Paper Box Co., Providence, R. I.
•Howell, F. M., & Co., Elmira, N. Y.
Imperial Paper Box Corp., Brooklyn, N.Y.
Indianapolis Paper Container Corp., Indianapolis
Jackson Paper Box Co., Jackson, Mich.
Jarisch Paper Box Co., No. Adams, Mass.
Jones, Jesse, Box Corp., Philadelphia
Jordan Paper Box Co., Chicago
Kalamazoo Paper Box Corp., Kalamazoo, Mich.
Kiernan-Hughes Co., Jersey City, N. J.
Kresge Paper Box Co., Bethlehem, Pa.
•Lebanon Paper Box Mfg. Co., Lebanon, Pa.
Lengsfield Brothers, Inc., New Orleans, La.
Levis, John A., & Sons, Inc., Rochester, N. Y.
Liberty Paper Box Co., Winona, Minn.
Livingston & Co., New York
Los Angeles Paper Box & Board Mills, Los Angeles
Mankato Paper Box Co., Mankato, Minn.
Manufacturers Box Co., Bridgeport, Conn.
Marion Paper Box Co., Marion, Ind.
Martin, Fair, Boxes, Inc., Concord, N. C.
Mason Box Co., Attleboro Falls, Mass.
Mautner Co., New York
Mead Packaging, Div. Mead Corp., Atlanta, Ga.
Metal Edge Industries, Barrington, N. J.
Miller, Walter P., Co., Philadelphia
Modern Boxes, Inc., Chicago
Mullery Paper Packages, Inc., St. Paul, Minn.
Newark Paper Box Co., Newark, N. J.
Northeast Paper Box Corp., Lowell, Mass.
Northwestern Paper Box Co., Seattle, Wash.
Novel Box Co., Brooklyn, N. Y.
Pacific Paper Box Co., Los Angeles
Pacific Paper Box Co., Portland, Ore.
Package Products Co., Charlotte, N. C.
•Packaging Components, Inc., New York
•Packaging Corp. of America, Evanston, Ill.
•Paper Package Co., Div. Creative Packaging, Inc., Indianapolis
Paragon Box Co., Atlanta, Ga.
Pharmacy Paper Box Co., Chicago
Piqua Paper Box Co., Piqua, Ohio
Pollock Paper Co., Div. St. Regis Paper Co., Dallas, Texas
Presque Isle Paper Products, Inc., Erie, Pa.
Quincy Paper Box Co., Quincy, Ill.
Reliance Paper Box Co., Philadelphia
Rhoades Paper Box Corp., Springfield, Ohio
Rowell, E. N., Co., Batavia, N. Y.
Royal-Pioneer Paper Box Mfg. Co., Philadelphia
St. Regis Paper Co., New York
San Jose Paper Box Co., Santa Clara, Calif.
Schleicher, F. J., Paper Box Co., St. Louis, Mo.
Scott & McDonald, Inc., Boston
Shadur Box Co., Milwaukee
Shaw Paper Box Co., Pawtucket, R. I.
Shaw-Randall Co., Pawtucket, R. I.
Shoup-Owens, Inc., Hoboken, N. J.
Simkins Paper Box Mfg. Co., Philadelphia
Snyder, George H., Inc., Philadelphia
Somerville Ltd., London, Ont.
Sonoco Products Co., Hartsville, S. C.
Southern Paper Box Co., Little Rock, Ark.
Specialty Paper Box Co., Los Angeles
Spitzer Paper Box Co., Toledo, Ohio
•Standard Packaging Corp., Bradley & Gilbert Div., Louisville, Ky.
State Paper Box Co., Columbus, Ohio
Stecker Paper Box Co., Detroit
Sternberger, Milton, Co., Memphis, Tenn.
Stone Container Corp., Chicago
Strouse, Adler Co., New Haven, Conn.
Taylor Box Co., Warren, R. I.
Tobin-Howe Paper Box Co., Clifton, N. J.
Trautmann, Bailey & Blampey, New York
Trum, E. J., Inc., Brooklyn, N. Y.
United States Box Co., Brooklyn, N. Y.
Universal Jewelry Case Co., Chicopee, Mass.
Utica Box Co., Utica, N. Y.
Voss, Karl, Corp., Hoboken, N. J.
Wallace Paper Box Corp., Maspeth, N. Y.
Warneke Paper Box Co., Denver, Colo.
•Warner Brothers Co./Packaging, Bridgeport, Conn.
Warren-Nicholson Co., Davenport, Iowa
Weil & Newman, Inc., Brooklyn, N. Y.
Whitney & Co., Leominster, Mass.
Williams Brothers Paper Box Co., St. Joseph, Mich.
Youse, C. J., Co., Baltimore, Md.
Zumbiel, C. W., Co., Cincinnati

BOXES, RIGID TRANSPARENT

(See Containers, Semi-Rigid, Transparent; Boxes, Molded Plastic, Stock)

BOXES, SHIPPING

(See Containers, Corrugated; Containers, Shipping)

BOXES, WIREBOUND WOODEN

Editorial information, Div. V Sec. 17

Chicago Mill & Lumber Co., Chicago
Cornell Paperboard Products Co., Div. St. Regis Paper Co., Milwaukee
Dunning, J. H., Corp., Darien, Conn.
Flour City Box Mfg. Co., Waterloo, Iowa
General Box Co., Des Plaines, Ill.
Gondert & Lienesch, Inc., Dayton, Ohio
Jones Box & Mill Division, No. Tonawanda, N. Y.
Lea, David M., & Co., Richmond, Va.
Main Brothers Box & Lumber Co., Karnak, Ill.
Marinette & Menominee Box Co., Marinette, Wis.
Martin Brothers Container & Timber Products Corp., Toledo, Ohio
Maxwell Brothers, Inc., Chicago
New England Box Co., Greenfield, Mass.
St. Regis Paper Co., New York
Southern Crate & Veneer Co., Macon, Ga.
Spring Wood Products, Inc., Geneva, Ohio

BOXES & BASKETS, FRUIT & VEGETABLE

A. Molded Pulp or Paperboard
B. Plastic
C. Veneer

Editorial information, Div. II Sec. 6, 8, Div. V Sec. 17

Alladin Plastics, Inc., Gardena, Calif. (B)
Artmor Plastics Corp., Cumberland, Md. (B)
Bestpak, Inc., Natick, Mass. (B)
•Bradley Associates, Inc., Chicago (B)
Chicago Mill & Lumber Co., Chicago (C)
Como Plastics, Inc., Columbus, Ind. (B)
Custom Merchandise Corp., Brooklyn, N. Y. (B)

Eclipse Plastic Industries, Inc., Sarasota, Fla. (B)
Expandex Corp., Wauregan, Conn. (B)
•Fibreboard Paper Products Corp., San Francisco (A)
Formed Container Corp., Sub. Phillips Petroleum Co., Orangeburg, N. Y. (B)
Heidi Plastics Corp., Yonkers, N. Y. (B)
Jones, Jesse, Box Corp., Philadelphia (B)
Keiding Paper Products Co., Milwaukee (A)
•Keyes Fibre Co., Waterville, Maine (A)
Lacollonge-Flexone, Paris, France (B)
Lea, David M., & Co., Richmond, Va. (C)
Metal Edge Industries, Barrington, N. J. (B)
National Packaging Corp., Fort Wayne, Ind. (B)
•Olin, Packaging Div., Forest Products Operations, W. Monroe, La. (A)
Oppenheim Co., New York (B)
•Owens-Illinois Glass Co., Toledo, Ohio (A)
•Packaging Corp. of America, Evanston, Ill. (A)
Peoria Plastic Co., E. Peoria, Ill. (B)
Plastic Enterprises, College Point, N. Y. (B)
Plasticon Corp., Minneapolis (B)
Plasti-Pak Containers Ltd., Toronto, Ont. (B)
Plast-O-Pak Corp., Leominster, Mass. (B)
•Plaxall, Inc., Long Island City, N. Y. (B)
Twinpak, Ltd., Lachine, Que. (B)
Valley-National Corp., Milldale, Conn. (B)

CANS, EXTRUDED, ROUND

(Aluminum, Lead, Tin)

Editorial information, Div. II Sec. 9

•Aluminum Co. of America, Pittsburgh
Bradley-Sun Div., American Can Co., Union, N. J.
Clarke Can Co., Philadelphia
•Continental Can Co., Metal Div., New York
Dale, John, Ltd., London, England
Impact Container Corp., Alden, N. Y.
Sherwin-Williams Co., Pigment, Color & Chemical Div., New York
Thompson Can Co., Dallas, Texas
Victor Metal Products Corp., Newport, Ark.
•Wirz, A. H., Inc., Chester, Pa.

CANS, FIBRE & COMPOSITE

Editorial information, Div. II Sec. 6

Abest Paper Box Co., New York
•American Can Co., Canco Div., New York
American Paper Products Co., Philadelphia
Baxter, J. C., Co., Minerva, Ohio
Cambridge Paper Box Co., Cambridge, Mass.
Chicago Mailing Tube Co., Chicago
•Cin-Made Corp., Cincinnati
•Cleveland Container Co., Cleveland
Container Corp. of America, Chicago
Crescent Paper Tube Co., Covington, Ky.
Harcord Mfg. Co., Jersey City, N. J.
Marshall Paper Tube Co., Randolph, Mass.
Mead Packaging, Div. Mead Corp., Liquid-Tight Container Plant, Lawrence, Mass.
Mitchell Paper Products Co., Bloomfield, N. J.
Mullery Paper Packages, Inc., St. Paul, Minn.
National Mfg. Co., Kansas City, Mo.
National Vulcanized Fibre Co., Wilmington, Del.
•Niemand Brothers, Inc., Elmhurst, N. Y.
•Niemand Industries, Statesville, N. C.
Ohio Paper Products Co., Massillon, Ohio
Penland Paper Converting Corp., Hanover, Pa.
Platt Corp., Baltimore, Md.
Queen City Paper Co., Cincinnati
R. C. Can Co., St. Louis, Mo.
Round Tubes & Cores Co., Chicago
Sealright Co., Fulton, N. Y.
Sefton Fibre Can Div., Container Corp. of America, St. Louis, Mo.
Shoup-Owens, Inc., Hoboken, N. J.
Sonoco Products Co., Hartsville, S. C.
Spenzer Container Corp., Greenville, Pa.
Stecker Paper Box Co., Detroit
Stone Container Corp., Chicago
Stonington Paper Tube Co., Holyoke, Mass.
United Container Co., Philadelphia

CANS, METAL

A. Aluminum
B. Tinplate

Editorial information, Div. II Sec. 9

•Aluminum Co. of America, Pittsburgh (A)
•American Can Co., Canco Div., New York (A, B)
Atlantic Can Co., Delawanna, N. J. (B)
Bradley-Sun Div., American Can Co., Union, N. J. (A)
Buckeye Stamping Co., Columbus, Ohio (B)
•Burdick & Son, Inc., Albany, N. Y. (B)
•Central Can Co., Chicago (B)
Central States Can Corp., Massillon, Ohio (A, B)
Clark, J. L., Mfg. Co., Rockford, Ill. (A, B)
Clarke Can Co., Philadelphia (A, B)
•Continental Can Co., Metal Div., New York (A, B)
•Crown Cork & Seal Co., Philadelphia (A, B)
Davies Can Co., Cleveland (B)
Ellisco, Inc., Philadelphia (A, B)
Empire Can Corp., Brooklyn, N. Y. (B)
Federal Tin Co., Baltimore, Md. (B)
Heekin Can Co., Cincinnati (A, B)
Impact Container Corp., Alden, N. Y. (A)
Independent Can Co., Baltimore, Md. (B)
•Kaiser Aluminum & Chemical Sales, Inc., Oakland, Calif. (A)
Krause, Frederick A., Associates, Inc., Frenchtown, N. J. (B)
Landau Metal Products Corp., Long Island City, N. Y. (A)
Lindsey Can Co., So. San Francisco, Calif. (B)
Milton, George A., Can Co., Brooklyn, N. Y. (B)
•National Can Corp., Chicago (A, B)
National Tin Can Mfy. Co., New York (A, B)
Olive Can Co., Chicago (B)
•Reynolds Metals Co., Richmond, Va. (A)
Rockford Package & Container Corp., Rockford, Ill. (A, B)
Sherwin-Williams Co., Pigment, Color & Chemical Div., New York (B)
Standard Can Corp., Leetsdale, Pa. (B)
Thompson Can Co., Dallas, Texas (B)
U. S. Hoffman Can Corp., Brooklyn, N. Y. (B)
Victor Metal Products Corp., Newport, Ark. (A)
Vulcan Containers (Canada) Ltd., Rexdale, Ont. (B)
Vulcan Steel Container Co., Birmingham, Ala. (B)
White Metal Mfg. Co., Hoboken, N. J. (A)
•Wirz, A. H., Inc., Chester, Pa. (A)

CANS, PAPER

(For Bulk Ice Cream)

Editorial information, Div. II Sec. 6

Cambridge Paper Box Co., Cambridge, Mass.
Lawson & Jones Ltd., London, Ont.
Mead Packaging, Div. Mead Corp., Liquid-Tight Container Plant, Lawrence, Mass.
Penland Paper Converting Corp., Hanover, Pa.
Sealright Co., Fulton, N. Y.
•Standard Packaging Corp., Fonda Container Div., St. Albans, Vt.
United Container Co., Philadelphia

CANS, PLASTIC-BODIED

Editorial information, Div. II Sec. 8

Bradley-Sun Div., American Can Co., Union, N. J.
•Cleveland Container Co., Cleveland
Container Corp. of America, Chicago
Dale, John, Ltd., London, England
Eclipse Plastic Industries, Inc., Sarasota, Fla.
Frank Plastics Corp., Detroit
Harcord Mfg. Co., Jersey City, N. J.
Haveg Industries, Inc., Blow-Molding Div., Bound Brook, N. J.
•Niemand Bros., Inc., Elmhurst, N. Y.
Ohio Paper Products Co., Massillon, Ohio
Plasti-Vue Mfg. Co., Fort Worth, Texas
•Plastofilm, Inc., Wheaton, Ill.
Plast-O-Pak Corp., Leominster, Mass.
Sefton Fibre Can Div., Container Corp. of America, St. Louis, Mo.
•Wirz, A. H., Inc., Chester, Pa.

CAPSULES

A. Gelatin Seamless
B. Plastic Two-Piece

Alfa Mfg. Co., Chicago (B)
•Lermer Plastics, Inc., Garwood, N. J. (B)
Scherer, R. P., Corp., Detroit (A)

CARBOYS

Editorial information, Div. V Sec. 17

Air Formed Products Corp., Sub. Bemis Bro. Bag Co., Nashua, N. H.
Delaware Barrel & Drum Co., Wilmington, Del.
Eclipse Plastic Industries, Sarasota, Fla.
•Erno Products Co., Philadelphia
Greif Bros. Cooperage Corp., Seymour & Peck Div., Blue Island, Ill.
Haveg Industries, Inc., Blow-Molding Div., Bound Brook, N. J.
Industrial Plastic Supply Div., Industrial Safety Supply Co., W. Hartford, Conn.
Lea, David M., & Co., Richmond, Va.
Letts Box & Mfg. Co., St. Joseph, Mo.
Plasticon Corp., Minneapolis
•Plax Corp., Hartford, Conn.
Sauer Cooperage Co., Wyandotte, Mich.
Treen Box Co., Philadelphia
Wilson Plastic Container Corp., Brooklyn, N. Y.

CARTONS, CAN & BOTTLE CARRIERS

Editorial information, Div. II Sec. 6

Andre Paper Box Co., San Leandro, Calif.
Badger Carton Co., Milwaukee
Brett Lithographing Co., Long Island City, N. Y.
Brooks & Porter, Inc., New York
Burton Packaging Co., Brooklyn, N. Y.
Carton Products Co., Chicago
•Chaspec Mfg. Co., Greenwich, Conn.
Clark, J. L., Mfg. Co., Rockford, Ill.
Collett-Sproule Boxes Ltd., Scarborough, Ont.
Columbus Paper Box Co., Columbus, Ohio
Conex Div., Illinois Tool Works, Des Plaines, Ill.
Consolidated Paper Co., Monroe, Mich.
Container Corp. of America, Chicago
•Continental Can Co., Folding Carton & Drum Div., New York
Cornell Paperboard Products Co., Div. St. Regis Paper Co., Milwaukee
•Creative Packaging, Inc., Indianapolis
Crown Zellerbach Corp., Western-Waxide Div., San Leandro, Calif.
•Downingtown Paper Co., Packaging Div., Downingtown, Pa.
Federal Carton Corp., No. Bergen, N. J.
•Fibreboard Paper Products Corp., San Francisco
Fleming & Sons, Inc., Magnolia Carton Div., Houston, Texas
Franklin Folding Box Co., Chicago
•Gardner Div., Diamond National Corp., Middletown, Ohio
Green Bay Box Co., Green Bay, Wis.
Grigsby Bros. Paper Box Mfrs., Portland, Ore.
Interstate Folding Box Co., Middletown, Ohio
KVP Sutherland Paper Co., Kalamazoo, Mich.
Lawson & Jones Ltd., London, Ont.
Lengsfield Bros., Inc., New Orleans, La.
Mead Packaging, Div. Mead Corp., Atlanta, Ga.
Michigan Carton Co., Battle Creek, Mich.
Nelson, B. F., Mfg. Co., Minneapolis
•Olin, Packaging Div., Forest Products Operations, W. Monroe, La.
Package & Display Corp., Brooklyn, N. Y.
•Packaging Corp. of America, Evanston, Ill.
Pollock Paper Co., Div. St. Regis Paper Co., Dallas, Texas
Potlatch Forests, Inc., Lewiston, Idaho
•Reynolds Metals Co., Richmond, Va.
Robertson Paper Box Co., Montville, Conn.
Rossotti Lithograph Corp., No. Bergen, N. J.
Schoettle, Edwin J., Co., No. Wales, Pa.
Schulz, A. Geo., Co., Milwaukee
Somerville Ltd., London, Ont.
Spear Box Co., New York
Standard Folding Trays Corp., Jackson Heights, N. Y.
•Standard Packaging Corp., Bradley & Gilbert Div., Louisville, Ky.
Standard Paper Box Corp., Los Angeles
Stecher-Traung Lithograph Corp., Rochester, N. Y.
Strange, John, Carton Co., Menasha, Wis.
United Container Co., Philadelphia
•United States Printing & Lithograph, Div. Diamond National Corp., New York
Universal Folding Box Co., Hoboken, N. J.
Van Vick Paper Box Co., Duluth, Minn.
Wagner Folding Box Corp., Buffalo, N. Y.
Waldorf Paper Products Co., St. Paul, Minn.
Weyerhaeuser Co., Boxboard & Folding Carton Div., Chicago

CARTONS, DISPENSING

(With Serrated Metal Edge)

Editorial information, Div. II Sec. 6

American Paper Box Co., Montreal, Que.
Burton Packaging Co., Brooklyn, N. Y.
Collett-Sproule Boxes Ltd., Scarborough, Ont.
Container Corp. of America, Chicago
•Continental Can Co., Folding Carton & Drum Div., New York
Forsberg Paper Box Co., Madison, Wis.
•Gardner Div., Diamond National Corp., Middletown, Ohio
Green Bay Box Co., Green Bay, Wis.
Interstate Folding Box Co., Middletown, Ohio
KVP Sutherland Paper Co., Kalamazoo, Mich.
•Lassiter, Div. Riegel Paper Corp., New York
•Marathon, Div. American Can Co., Menasha, Wis.
•Packaging Corp. of America, Evanston, Ill.
Robertson Paper Box Co., Montville, Conn.
St. Regis Paper Co., New York
Schulz, A. Geo., Co., Milwaukee
Somerville Ltd., London, Ont.
Universal Folding Box Co., Hoboken, N. J.
Waldorf Paper Products Co., St. Paul, Minn.
Weyerhaeuser Co., Boxboard & Folding Carton Div., Chicago
Zumbiel, C. W., Co., Cincinnati

CARTONS, FOLDING & DISPLAY

(Folding Boxes)

Editorial information, Div. II Sec. 6

Abest Paper Box Co., New York
Acme Folding Box Co., Brooklyn, N. Y.
Admiral Paperbox Corp., Long Beach, Calif.
Ainslie Co., Div. Boise Cascade Corp., Spokane, Wash.
Albemarle Paper Mfg. Co., Richmond, Va.
American Die & Box Co., Denver, Colo.
American Paper Box Co., Montreal, Que.
Andre Paper Box Co., San Leandro, Calif.
Arkay Printing Co., New York
Arundel Box & Coating Corp., Baltimore, Md.
Atlantic Carton Corp., Norwich, Conn.
Badger Carton Co., Milwaukee
Bay Cities Paperbox Co., Oakland, Calif.
Bell, Edwin, Cooperage Co., Pittsburgh
Bennett Products, Inc., Rockford, Ill.
Berles Carton Co., Paterson, N. J.
Bestpak, Inc., Natick, Mass.
Bicknell & Fuller Paper Box Co., Boston
Blum Folding Paper Box Co., Valley Stream, N. Y.
Bock, Frank, New York
Boxmakers, Inc., Westfield, Mass.
Brett Lithographing Co., Long Island City, N. Y.
Brooks & Porter, Inc., New York
Brothers Paper Box Co., Sioux City, Iowa
Brown & Bailey Co., Philadelphia
Burd & Fletcher Co., Kansas City, Mo.
Burt, F. N., Co., Buffalo, N. Y.
Burton Packaging Co., Brooklyn, N. Y.
Calumet Carton Co., Homewood, Ill.
Cambridge Paper Box Co., Cambridge, Mass.
Carton Products Co., Chicago
Carton Service, Inc., Shelby, Ohio
•Chaspec Mfg. Co., Greenwich, Conn.
Chicago Carton Co., Div. Waldorf Paper Products Co., Chicago
Chicago Paper Box Co., Chicago
Chopp Printing Specialties, Inc., New York
•Cincinnati Box & Partition Co., Cincinnati
Climax Mfg. Co., Castorland, N. Y.
Collett-Sproule Boxes Ltd., Scarborough, Ont.
Color Reproductions, Inc., Union, N. J.
Columbus Paper Box Co., Columbus, Ohio
Comly-Gillam Carton Corp., Philadelphia
Consolidated Box Co., Tampa, Fla.
Consolidated Lithographing Corp., Carle Place, N. Y.
Consolidated Lithographing Div., Somerville Ltd., Montreal, Que.
Consolidated Paper Co., Monroe, Mich.
Consolidated Water Power & Paper Co., Wisconsin Rapids, Wis.
Container Corp. of America, Chicago
•Continental Can Co., Folding Carton & Drum Div., New York
Continental Folding Paper Box Co., Ridgefield, N. J.
Cooper Paper Box Div., Clarkson Press, Inc., Buffalo, N. Y.
Cornell Paperboard Products Co., Div. St. Regis Paper Co., Milwaukee
Corson Mfg. Co., Lockport, N. Y.
•Creative Packaging, Inc., Indianapolis
Crocker, H. S., Co., San Bruno, Calif.
Crown Paper Box Corp., Indianapolis
Crown Zellerbach Corp., Western-Waxide Div., San Leandro, Calif.
Curtis S., & Son, Sandy Hook, Conn.
Davis, S. H., Paper Box Co., Toledo, Ohio
Diamond Paper Box Co., Philadelphia
Diamond Printing & Label Corp., Philadelphia
•Downingtown Paper Co., Packaging Div., Downingtown, Pa.
Eagle Paper Box Mfg. Co., Chicago
Ellis Paperboard Products, Inc., Portland, Maine
Feder Industries, Inc., New York
Federal Carton Corp., No. Bergen, N. J.
•Fibreboard Paper Products Corp., San Francisco
Field Container Corp., Elk Grove Village, Ill.
Flashfold Box Corp., Fort Wayne, Ind.
Flintkote Co., Los Angeles
Flower City Specialty Co., Rochester, N. Y.
Foilcraft Printing Corp., New York
•Foils Packaging Corp., Cincinnati
Forsberg Paper Box Co., Madison, Wis.
Fox, C. J., Co., Providence, R. I.
Franklin Folding Box Co., Chicago
Franklyn Folding Box Co., Flushing, N. Y.
Gardner-Brooks, Inc., Sub. Diamond National Corp., Springfield, Mass.
•Gardner Div., Diamond National Corp., Middletown, Ohio
Gerald Carton Co., Brooklyn, N. Y.
Gerbereux, Dufft & Kinder, Brooklyn, N. Y.
Gift Box Corp. of America, New York
Green Bay Box Co., Green Bay, Wis.
Grigsby Bros. Paper Box Mfrs., Portland, Ore.
Hilsher Paper Box Co., Kingston, Pa.
Holyoke Die Cut Card Co., Holyoke, Mass.
House of Harley, Inc., New York
•Howell, F. M., & Co., Elmira, N. Y.
Indianapolis Paper Container Corp., Indianapolis
International Folding Paper Box Co., No. Bergen, N. J.
•International Paper Co., New York
Interstate Folding Box Co., Middletown, Ohio
KVP Sutherland Paper Co., Kalamazoo, Mich.
Kalamazoo Paper Box Corp., Kalamazoo, Mich.

Keystone Folding Box Co., Newark, N. J.
Keystone Paper Box Co., York, Pa.
Kirchheimer Brothers Co., Chicago
Laminated Paper Products, Santa Clara, Calif.
Lawson & Jones Ltd., London, Ont.
•Lebanon Paper Box Mfg. Co., Lebanon, Pa.
Lengsfield Bros., Inc., New Orleans, La.
Leominster Paper Box Co., Leominster, Mass.
Lewy, Morris L., & Co., New York
Lord Baltimore Press, New York
Los Angeles Box & Board Mills, Los Angeles
Mankato Paper Box Co., Mankato, Minn.
Manufacturers Box Co., Bridgeport, Conn.
•Marathon, Div. American Can Co., Menasha, Wis.
Marion Paper Box Co., Marion, Ind.
Maryland Paper Box Co., Baltimore, Md.
Mead Packaging, Div. Mead Corp., Atlanta, Ga.
Metal Edge Industries, Barrington, N. J.
Michigan Carton Co., Battle Creek, Mich.
Mid-York Press, Inc., Hamilton, N. Y.
•Milprint, Inc., Milwaukee
Mullery Paper Packages, Inc., St. Paul, Minn.
National Paper Box Mfg. Co., Philadelphia
Nelson, B. F., Mfg. Co., Minneapolis
Nevins Co., Clifton, N. J.
New York Label & Box Corp., New York
Nifty Mfg. Div., St. Regis Paper Co., Birmingham, Ala.
Oakland Paper Box Co., Emeryville, Calif.
•Olin, Packaging Div., Forest Products Operations, W. Monroe, La.
Pacific Paper Box Co., Portland, Ore.
Package & Display Corp., Brooklyn, N. Y.
•Packaging Corp. of America, Evanston, Ill.
Packers Package, Inc., Muncie, Ind.
Paco Div., Inlander-Steindler Paper Co., Chicago
•Paper Package Co., Div. Creative Packaging, Inc., Indianapolis
Parrot Litho A/S, Copenhagen, Denmark
Peerless Packages, Inc., Cleveland
Philadelphia Folding Box Co., Philadelphia
Pinkerton Folding Box Co., Chicago
Pioneer Folding Box, Inc., Chicopee, Mass.
Planned Displays, Inc., Leominster, Mass.
Pollock Paper Co., Div. St. Regis Paper Co., Dallas, Texas
Potlatch Forests, Inc., Lewiston, Idaho
Potlatch Forests, Inc., Penn-Mar Div., Baltimore, Md.
Premier Packages, Inc., St. Louis, Mo.
Promotional Container Co., Newark, N. J.
Randolph Paper Box Co., Div. Albemarle Paper Mfg. Co., Richmond, Va.
Reliance Paper Box Co., Philadelphia
•Richardson Taylor-Globe Corp., Cincinnati
•Riegel Paper Corp., New York
Robertson Paper Box Co., Montville, Conn.
Rollprint Products Corp., Chicago
Rossotti Lithograph Corp., No. Bergen, N. J.
Rothchild Printing Co., New York
Royal Paper Box Co., Los Angeles
Royal-Pioneer Paper Box Mfg. Co., Philadelphia
St. Regis Paper Co., New York
Sample-Durick Co., Chicopee, Mass.
San Jose Paper Box Co., Santa Clara, Calif.
Schenker Co., Chicago
Schmidt Lithograph Co., San Francisco
Schoettle, Edwin J., Co., No. Wales, Pa.
Schultz, A. Geo., Co., Milwaukee
Scott & Daniells, Inc., Portland, Conn.
Shadur Box Co., Milwaukee
Snyder, George H., Inc., Philadelphia
Somerville Ltd., London, Ont.
Southern Paper Box Co., Little Rock, Ark.
Spear Box Co., New York
Spitzer Paper Box Co., Toledo, Ohio
Standard Folding Trays Corp., Jackson Heights, N. Y.
•Standard Packaging Corp., Bradley & Gilbert Div., Louisville, Ky.
Standard Paper Box Corp., Los Angeles
Stecher-Traung Lithograph Corp., Rochester, N. Y.
Stecker Paper Box Co., Detroit
Sternberger, Milton, Co., Memphis, Tenn.
Stone Container Corp., Chicago
Strange, John, Carton Co., Menasha, Wis.
Swayze Folding Box Co., Canton, Pa.
Toledo Paper Box Co., Toledo, Ohio
Trenton Folding Box Co., Trenton, N. J.
Trum, E. J., Inc., Brooklyn, N. Y.
Unger Co., Cleveland
Union Bag-Camp Paper Corp., New York
United Container Co., Philadelphia
U. S. Corrugated Fibre Box Co., Indianapolis
United States Box Co., Brooklyn, N. Y.
•United States Printing & Lithograph, Div. Diamond National Corp., New York
Universal Folding Box Co., Hoboken, N. J.
Utica Box Co., Utica, N. Y.
Utility Printing Co., Carlstadt, N. J.
Valley-National Corp., Milldale, Conn.
Van Vick Paper Box Co., Duluth, Minn.
Virginia Folding Box Co., Sub. West Virginia Pulp & Paper Co., Richmond, Va.
Vizuall Co., New York
Wagner Folding Box Corp., Buffalo, N. Y.
Wagner, Victor, & Son, Inc., Buffalo, N. Y.
Waldorf Paper Products Co., St. Paul, Minn.
Warneke Paper Box Co., Denver, Colo.
•Warner Brothers Co./Packaging, Bridgeport, Conn.
Warren-Nicholson Co., Davenport, Iowa
Weil's, David, Sons Lithographic Co., Brooklyn, N. Y.
Weyerhaeuser Co., Boxboard & Folding Carton Div., Chicago
Whitney & Co., Leominster, Mass.
Wilkata Folding Box Co., Kearny, N. J.
Williams Brothers Paper Box Co., St. Joseph, Mich.
Zuckerman, Joseph, Inc., Yonkers, N. Y.
Zumbiel, C. W., Co., Cincinnati

CARTONS, PRESSURE-SENSITIVE-COATED (For Blister Packs)

Ackermann, G. A., Printing Co., Cicero, Ill.
Acme Folding Box Co., Brooklyn, N. Y.
American Die & Box Co., Denver, Colo.
•American Packaging Corp., Cleveland
American Paper Box Co., Montreal, Que.
Badger Carton Co., Milwaukee
Bicknell & Fuller Paper Box Co., Boston
Bock, Frank, New York
Box Shop, Inc., New Haven, Conn.
Boxmakers, Inc., Westfield, Mass.
Brooks & Porter, Inc., New York
Burton Packaging Co., Brooklyn, N. Y.
Carton Products Co., Chicago
•Chaspec Mfg. Co., Greenwich, Conn.
Chopp Printing Specialties, Inc., New York
•Cincinnati Box & Partition Co., Cincinnati
Columbus Paper Box Co., Columbus, Ohio
Comly-Gillam Carton Corp., Philadelphia
Container Corp. of America, Chicago
•Continental Can Co., Folding Carton & Drum Div., New York
Cornell Paperboard Products Co., Div. St. Regis Paper Co., Milwaukee
•Creative Packaging, Inc., Indianapolis
Crystal Preforming & Packaging, Inc., Warsaw, Ind.
Diamond Printing & Label Corp., Philadelphia
Field Container Corp., Elk Grove Village, Ill.
Fleming & Sons, Inc., Magnolia Carton Div., Houston, Texas
Fox, C. J., Co., Providence, R. I.
Franklin Folding Box Co., Chicago
Holyoke Die Cut Card Co., Holyoke, Mass.
Keystone Folding Box Co., Newark, N. J.
•Lassiter, Div. Riegel Paper Corp., New York
Lawson & Jones Ltd., London, Ont.
Mankato Paper Box Co., Mankato, Minn.
Manufacturers Box Co., Bridgeport, Conn.
Maryland Paper Box Co., Baltimore, Md.
Nelson, B. F., Mfg. Co., Minneapolis
Normandie Press, Inc., New York
•Packaging Corp. of America, Evanston, Ill.
•Paper Package Co., Div. Creative Packaging, Inc., Indianapolis
Philadelphia Paper Box Co., Philadelphia
Pioneer Folding Box, Chicopee, Mass.
Robertson Paper Box Co., Montville, Conn.
Royal Paper Box Co., Los Angeles
Schulz, A. Geo., Co., Milwaukee
Somerville Ltd., London, Ont.
Spear Box Co., New York
Standard Paper Box Corp., Los Angeles
Strange, John, Carton Co., Menasha, Wis.
Trenton Folding Box Co., Trenton, N. J.
United States Box Co., Brooklyn, N. Y.
•United States Printing & Lithograph, Div. Diamond National Corp., New York
Universal Folding Box Co., Hoboken, N. J.
Wagner Folding Box Corp., Buffalo, N. Y.
•Warner Brothers Co./Packaging, Bridgeport, Conn.
Weyerhaeuser Co., Boxboard & Folding Carton Div., Chicago
Zuckerman, Joseph, Inc., Yonkers, N. Y.
Zumbiel, C. W., Co., Cincinnati

CARTONS, WAXED & PARAFFINED

Editorial information, Div. II Sec. 6

Ainslie Co., Div. Boise Cascade Corp., Spokane, Wash.
Albemarle Paper Mfg. Co., Richmond, Va.
American Die & Box Co., Denver, Colo.
American Paper Box Co., Montreal, Que.
Andre Paper Box Co., San Leandro, Calif.
Arkay Printing Co., New York
Badger Carton Co., Milwaukee
Bay Cities Paperbox Co., Oakland, Calif.
Berles Carton Co., Paterson, N. J.
Brooks & Porter, Inc., New York
Burd & Fletcher Co., Kansas City, Mo.
Burt, F. N., Co., Buffalo, N. Y.
Burton Packaging Co., Brooklyn, N. Y.
Carton Products Co., Chicago
Chicago Carton Co., Div. Waldorf Paper Products Co., Chicago
Climax Mfg. Co., Castorland, N. Y.
Collett-Sproule Boxes Ltd., Scarborough, Ont.
Columbus Paper Box Co., Columbus, Ohio

Consolidated Box Co., Tampa, Fla.
Consolidated Paper Co., Monroe, Mich.
Container Corp. of America, Chicago
•Continental Can Co., Folding Carton & Drum Div., New York
Continental Folding Paper Box Co., Ridgefield, N. J.
Cornell Paperboard Products Co., Div. St. Regis Paper Co., Milwaukee
•Creative Packaging, Inc., Indianapolis
Crocker, H. S., Co., San Bruno, Calif.
Crown Zellerbach Corp., Western-Waxide Div., San Leandro, Calif.
Crystal Preforming & Packaging, Inc., Warsaw, Ind.
Ellis Paperboard Products, Portland, Me.
Fleming & Sons, Inc., Magnolia Carton Div., Houston, Texas
Flintkote Co., Los Angeles
Forsberg Paper Box Co., Madison, Wis.
Franklin Folding Box Co., Chicago
Gardner-Brooks, Inc., Sub. Diamond National Corp., Springfield, Mass.
•Gardner Div., Diamond National Corp., Middletown, Ohio
KVP Sutherland Paper Co., Kalamazoo, Mich.
Kalamazoo Paper Box Corp., Kalamazoo, Mich.
•Kordite Corp., Div. National Distillers & Chemical Corp., Macedon, N. Y.
Laminated Paper Products, Santa Clara, Calif.
•Lassiter, Div. Riegel Paper Corp., New York
Lengsfield Bros., Inc., New Orleans, La.
Lord Baltimore Press, New York
Los Angeles Paper Box & Board Mills, Los Angeles
•Marathon, Div. American Can Co., Menasha, Wis.
Maryland Paper Box Co., Baltimore, Md.
Mead Packaging, Div. Mead Corp., Atlanta, Ga.
Metal Edge Industries, Barrington, N. J.
Michigan Carton Co., Battle Creek, Mich.
•Milprint, Inc., Milwaukee
Nelson, B. F., Mfg. Co., Minneapolis
Nifty Mfg. Div., St. Regis Paper Co., Birmingham, Ala.
•Olin, Packaging Div., Forest Products Operations, W. Monroe, La.
Packers Package, Inc., Muncie, Ind.
Paco Div., Inlander-Steindler Paper Co., Chicago
•Paper Package Co., Div. Creative Packaging, Inc., Indianapolis
Peerless Packages, Inc., Cleveland
Philadelphia Folding Box Co., Philadelphia
Pollock Paper Co., Div. St. Regis Paper Co., Dallas, Texas
Potlatch Forests, Inc., Lewiston, Idaho
Potlatch Forests, Inc., Penn-Mar Div., Baltimore, Md.
Randolph Paper Box Co., Div. Albemarle Paper Mfg. Co., Richmond, Va.
•Richardson Taylor-Globe Corp., Cincinnati
•Riegel Paper Corp., New York
Robertson Paper Box Co., Montville, Conn.
Safelon Corp., Yonkers, N. Y.
St. Regis Paper Co., New York
Schoettle, Edwin J., Co., No. Wales, Pa.
Somerville Ltd., London, Ont.
•Standard Packaging Corp., Bradley & Gilbert Div., Louisville, Ky.
Standard Paper Box Corp., Los Angeles
Strange, John, Carton Co., Menasha, Wis.
Toledo Paper Box Co., Toledo, Ohio
Unger Co., Cleveland
United Container Co., Philadelphia
U. S. Corrugated Fibre Box Co., Indianapolis
•United States Printing & Lithograph, Div. Diamond National Corp., New York
Virginia Folding Box Co., Sub. West Virginia Pulp & Paper Co., Richmond, Va.
Wagner Folding Box Corp., Buffalo, N. Y.
Wagner, Victor, & Son, Inc., Buffalo, N. Y.
Weyerhaeuser Co., Boxboard & Folding Carton Div., Chicago
Whitney & Co., Leominster, Mass.
Zumbiel, C. W., Co., Cincinnati

CONTAINERS, AEROSOL

A. Cans
B. Glass Bottles
C. Glass Containers, Plastic-Coated
D. Industrial Cylinders
E. Metal Spheres
F. Plastic Containers

Editorial information, Div. II Sec. 11

•Aluminum Co. of America, Pittsburgh (A)
•American Can Co., Canco Div., New York (A)
American Cellular Corp., Miami, Fla. (F)
Apcon Co., Independence, Mo. (F)
Bradley-Sun Div., American Can Co., Union, N. J. (A)
Braun, W., Co., Chicago (F)
Brockway Glass Co., Brockway, Pa. (B)
Builders Sheet Metal Works, Inc., New York (A, B, C, D)
Carr-Lowrey Glass Co., Baltimore, Md. (B)
Clarke Can Co., Philadelphia (A)
Consumers Glass Co., Montreal, Que. (B)
•Continental Can Co., Metal Div., New York (A)
•Crown Cork & Seal Co., Philadelphia (A)
Dale, John, Ltd., London, England (A)
Dominion Glass Co., Montreal, Que. (B, C)
Eclipse Plastic Industries, Inc., Sarasota, Fla. (F)
Emson Research, Inc., Bridgeport, Conn. (A)
Foster-Forbes Glass Co., Marion, Ind. (B)
•Frank, Walter, Organization, Hillside, Ill. (A, B)
Haveg Industries, Inc., Blow-Molding Div., Bound Brook, N. J. (F)
•Imco Container Co., Kansas City, Mo. (F)
Impact Container Corp., Alden, N. Y. (A, D)
Maryland Glass Corp., Baltimore, Md. (B)
Metal Fabrications, Inc., Waterbury, Conn. (A)
•Owens-Illinois Glass Co., Toledo, Ohio (B, C)
•Peerless Tube Co., Bloomfield, N. J. (A)
Plasti-Vue Mfg. Co., Fort Worth, Texas (F)
•Plax Corp., Hartford, Conn. (F)
•Reynolds Metals Co., Richmond, Va. (A)
Sherwin-Williams Co., Pigment, Color & Chemical Div., New York (A)
Sprayway, Inc., Chicago (A)
Tube Manifold Corp., No. Tonawanda, N. Y. (D, E)
Tubophane S.A., Paris, France (F)
Victor Metal Products Corp., Newport, Ark. (A)
Wheaton Glass Co., Millville, N. J. (C)
•Wirz, A. H., Inc., Chester, Pa. (A, F)

CONTAINERS, ALUMINUM, FORMED

Editorial information, Div. II Sec. 9

•Aluminum Co. of America, Pittsburgh
Aluminum Foil Packaging Co., Fort Madison, Iowa
•Anaconda Aluminum Co., Louisville, Ky.
Dale, John, Ltd., London, England
•Ekco-Alcoa Containers, Inc., Wheeling, Ill.
•Kaiser Aluminum & Chemical Sales, Inc., Oakland, Calif.
Metal Fabrications, Inc., Waterbury, Conn.
Mirro Aluminum Co., Manitowoc, Wis.
Penny Plate, Inc., Haddonfield, N. J.
Revere Copper & Brass, Inc., New York
•Reynolds Metals Co., Richmond, Va.
Scovill Mfg. Co., Waterbury, Conn.
Standard Foil Products Corp., Springfield, Mass.
Star Aluminium Co., Wolverhampton, England
•Sterling Seal Co., Erie, Pa.
•Wirz, A. H., Inc., Chester, Pa.

CONTAINERS, CORRUGATED & SOLID FIBRE

Editorial information, Div. V Sec. 17

Able Container Co., Chicago
Ainslie Co., Div. Boise Cascade Corp., Spokane, Wash.
Albemarle Paper Mfg. Co., Richmond, Va.
Allcraft Container Corp., Harrison, N. J.
American Box Corp., San Francisco
Bay Cities Paperbox Co., Oakland, Calif.
Bell, Edwin, Cooperage Co., Pittsburgh
Bell Fibre Products Co., Marion, Ind.
Bennett Products, Inc., Rockford, Ill.
Bicknell & Fuller Paper Box Co., Boston
Binghamton Container Co., Binghamton, N. Y.
Boise Cascade Container Corp., Wallula, Wash.
Capital City Container Co., Albany, N. Y.
Chicago Carton Co., Div. Waldorf Paper Products Co., Chicago
Chicago Paper Box Co., Chicago
Commercial Corrugated Container Corp., Brooklyn, N. Y.
Consolidated Paper Co., Monroe, Mich.
Consolidated Water Power & Paper Co., Wisconsin Rapids, Wis.
Container Corp. of America, Chicago
•Continental Can Co., Corrugated Container Div., New York
Cornell Paperboard Products Co., Div. St. Regis Paper Co., Milwaukee
Diamond Paper Box Co., Philadelphia
Dixie Container Corp., Richmond, Va.
Dorey Corrugated Paper Products, Inc., Scottsville, N. Y.
Downing Box Co., Milwaukee
•Fibreboard Paper Products Corp., San Francisco
Flintkote Co., Los Angeles
Forsberg Paper Box Co., Madison, Wis.
Gardiner Paper Mills, Inc., Gardiner, Maine
Gaylord Container Div., Crown Zellerbach Corp., St. Louis, Mo.
Gem Corrugated Box Corp., New York
General Box Co., Des Plaines, Ill.
Georgia-Pacific Paper Co., Portland, Ore.
Gould, Stephen, Paper Co., Bayonne, N. J.
Grand-City Container Corp., No. Bergen, N. J.
Green Bay Box Co., Green Bay, Wis.
•Greif Brothers Cooperage Corp., Delaware, Ohio
Greif Bros. Cooperage Corp., H. Bettis Div., Zanesville, Ohio
Hinde & Dauch Div., West Virginia Pulp & Paper Co., Sandusky, Ohio
•Hoerner Boxes, Inc., Keokuk, Iowa
Hollinger Corp., Arlington, Va.
Inland Container Corp., Indianapolis
•International Paper Co., New York
Jones, Jesse, Box Corp., Philadelphia
Kankakee Container Co., Kankakee, Ill.
Lanzit Corrugated Box Co., Chicago
Lawless Brothers Container Corp., No. Tonawanda, N. Y.

Lawrence Paper Co., Lawrence, Kan.
Liberty Paper Box Co., Winona, Minn.
Longview Fibre Co., Longview, Wash.
Marinette & Menominee Box Co., Marinette, Wis.
Massillon Container Co., Navarre, Ohio
Maxwell Brothers, Inc., Chicago
Mead Containers, Div. Mead Corp., Cincinnati
Metal Edge Industries, Barrington, N. J.
Midland Container Corp., St. Louis, Mo.
Nash-Hammond, Inc., El Monte, Calif.
New England Container Co., Chicopee, Mass.
Nifty Mfg. Div., St. Regis Paper Co., Birmingham, Ala.
O'Grady Containers, Inc., Fort Worth, Texas
•Olin, Packaging Div., Forest Products Operations, W. Monroe, La.
•Packaging Corp. of America, Evanston, Ill.
Pollock Paper Co., Div. St. Regis Paper Co., Dallas, Texas
River Raisin Paper Co., Div. Union Bag-Camp Paper Corp., Monroe, Mich.
St. Joe Paper Co., Houston Container Div., Houston, Texas
St. Regis Paper Co., New York
Schulz, A. Geo., Co., Milwaukee
Shillington Box & Lumber Co., St. Louis, Mo.
Sonoco Products Co., Hartsville, S. C.
Southern Special Products, Richmond, Va.
Spring Wood Products, Inc., Geneva, Ohio
Standard Corrugated Case Corp., Ridgefield, N. J.
Stone Container Corp., Chicago
Tri-Wall Containers, Inc., New York
Union Bag-Camp Paper Corp., New York
United Container Co., Philadelphia
U. S. Corrugated Fibre Box Co., Indianapolis
Wabash Fibre Box Co. Div., Weston Paper & Mfg. Co., Terre Haute, Ind.
Waldorf Paper Products Co., St. Paul, Minn.
Weber, David, Co., Philadelphia
Weston Paper & Mfg. Co., Dayton, Ohio

CONTAINERS, CORRUGATED & SOLID FIBRE WITH WOODEN FRAMES

Editorial information, Div. V Sec. 17

American Box Corp., San Francisco
Atlas General Industries, Inc., New York
Chicago Mill & Lumber Co., Chicago
Clinch-Tite Corp., Ardmore, Pa.
Cronk Box Corp., Highland Park, N. J.
Cumberland Box Co., Cumberland, Md.
Dunning, J. H., Corp., Darien, Conn.
Gardiner Paper Mills, Gardiner, Me.
General Box Co., Des Plaines, Ill.
Gondert & Lienesch, Inc., Dayton, Ohio
Hill & Neumann Co., Jersey City, N. J.
•International Paper Co., New York
Marathon Box Co., Wausau, Wis.
Marinette & Menominee Box Co., Marinette, Wis.
Maxwell Brothers, Inc., Chicago
Mead Containers, Div. The Mead Corp., Cincinnati
Moraine Box Co., Dayton, Ohio
Nash-Hammond, Inc., El Monte, Calif.
Packing Material Co., Detroit
St. Regis Paper Co., New York
Specialized Packaging Engineering Co., Phoenix, Ariz.
United Container Co., Philadelphia
Waldorf Paper Products Co., St. Paul, Minn.
Weyerhaeuser Co., Shipping Container Div., Chicago

CONTAINERS, FLEXIBLE

(See Bags & Envelopes)

CONTAINERS, INSULATED

(Bags, Cartons, Cases, Etc.)

Editorial information, Div. V Sec. 17

Bennett Products, Inc., Rockford, Ill.
Can-Pro Corp., Fond du Lac, Wis.
Chicago Carton Co., Div. Waldorf Paper Products Co., Chicago
Columbian Rope Co., Auburn, N. Y.
Frank Plastics Corp., Detroit
Glo-Brite Foam Plastics, Inc., Chicago
•Jiffy Mfg. Co., Hillside, N. J.
Kehr Products Co., Willow Grove, Pa.
L. M. Plastics Co., Lake Mills, Iowa
Melrose Packaging Corp., Flushing, N. Y.
•Plas-Tech, Inc., St. Paul, Minn.
Plasti-Vue Mfg. Co., Fort Worth, Texas
Prepac, Inc., New York
Sirco Mfg. Corp., New York
•Thilmany Pulp & Paper Co., Kaukauna, Wis.
Union Bag-Camp Paper Corp., New York
United Container Co., Philadelphia
•Weber Plastics, Inc., Stevens Point, Wis.

CONTAINERS, MOLDED PULP

Editorial information, Div. II Sec. 6

•Animal Trap Co. of America, Lititz, Pa.
Bemis Bro. Bag Co., St. Louis, Mo.
Creative Moulded Products Co., Brooklyn, N. Y.
General Fibre Co., St. Louis, Mo.
Keiding Paper Products Co., Milwaukee, Wis.
•Keyes Fibre Co., Waterville, Maine
•Packaging Corp. of America, Evanston, Ill.
Pulp Reproduction Co., Milwaukee

CONTAINERS, PAPER

A. Liquid-Holding
B. Milk
C. Nesting

Editorial information, Div. II Sec. 6

•American Can Co., Canco Div., New York (B)
Arundel Box & Coating Corp., Baltimore, Md. (C)
Comly-Gillam Carton Corp., Philadelphia (C)
Consolidated Lithographing Div., Somerville Ltd., Montreal, Que. (B)
•Continental Can Co., Bondware Div., Newark, N. J. (A, C)
Crown Zellerbach Corp., Western-Waxide Div., San Leandro, Calif. (A, B)
Crystal Preforming & Packaging, Inc., Warsaw, Ind. (A, B)
Dixie Cup Div., American Can Co., Easton, Pa. (A, C)
•Fibreboard Paper Products Corp., San Francisco (A, B, C)
•Foils Packaging Corp., Cincinnati (A, B)
Grigsby Bros. Paper Box Mfrs., Portland, Ore. (C)
•International Paper Co., New York (A, B)
Interstate Folding Box Co., Middletown, Ohio (A)
Kansas City Container Co., Kansas City, Mo. (A, C)
•Lassiter, Div. Riegel Paper Corp., New York (A)
Lily-Tulip Cup Corp., New York (A, C)
Manufacturers Box Co., Bridgeport, Conn. (C)
Mead Packaging, Div. Mead Corp., Liquid-Tight Container Plant, Lawrence, Mass. (A)
National Mfg. Co., Kansas City, Mo. (A)
Packet Research Corp., Boston (A)
Potlatch Forests, Inc., Lewiston, Idaho (A, B, C)
Raisin, John T., Corp., San Francisco (C)
Randolph Paper Box Co., Div. Albemarle Paper Mfg. Co., Richmond, Va. (C)
Sayford Corp., Litchfield, Conn. (A, C)
Sealright Co., Fulton, N. Y. (A, B, C)
•Standard Packaging Corp., Fonda Container Div., St. Albans, Vt. (A)
•Standard Packaging Corp., Normandie Cup Div., Alexandria, Va. (C)
Tetra Pak Co., Union, N. J. (A, B)
Weyerhaeuser Co., Milk Carton Div., Camden, N. J. (B)

CONTAINERS, PLYWOOD

Editorial information, Div. V Sec. 17

American Box Corp., San Francisco
Atlas General Industries, Inc., New York
•Auer, J. F., Inc., Mamaroneck, N. Y.
Bigelow-Garvey Lumber Co., Chicago
Carroll Box & Pallet Co., Los Angeles
Chicago Mill & Lumber Co., Chicago
Clinch-Tite Corp., Ardmore, Pa.
Cronk Box Corp., Highland Park, N. J.
Cumberland Box Co., Cumberland, Md.
Dunning, J. H., Corp., Darien, Conn.
Gondert & Lienesch, Inc., Dayton, Ohio
Greif Bros. Cooperage Corp., Seymour & Peck Div., Blue Island, Ill.
Hill & Neumann Co., Jersey City, N. J.
Lea, David M., & Co., Richmond, Va.
Martin Brothers Container & Timber Products Corp., Toledo, Ohio
Moraine Box Co., Dayton, Ohio
New England Box Co., Greenfield, Mass.
Nussbaum Novelty Mfg. Co., Berne, Ind.
Packaging & Converting Co., Washington, D. C.
Packing Material Co., Detroit
Regent Specialties, Div. Angle Genessee Corp., Rochester, N. Y.
Seattle Box Co., Seattle, Wash.
Smeed Box Co., Cleveland
Specialized Packaging Engineering Co., Phoenix, Ariz.
Spring Wood Products, Inc., Geneva, Ohio
Townson, W. D., Lumber Co., Murphy, N. C.
United Container Co., Philadelphia

CONTAINERS, POTTERY

Editorial information, Div. IV Sec. 15

Gigante Paper Box Co., Jersey City, N. J.
Hull Pottery Co., Crooksville, Ohio
Western Stoneware Co., Div. Great Lakes Industries, Monmouth, Ill.
•Zanesville Stoneware Co., Zanesville, Ohio

CONTAINERS, SELF-SEALING

A. Corrugated
B. Paperboard (Folding Cartons)

Acme Folding Box Co., Brooklyn, N. Y. (B)
American Paper Box Co., Montreal, Que. (B)
Brooks & Porter, Inc., New York (B)
Burton Packaging Co., Brooklyn, N. Y. (B)

Chopp Printing Specialties, Inc., New York (B)
Columbus Paper Box Co., Columbus, Ohio (B)
Comly-Gillam Carton Corp., Philadelphia (B)
Container Corp. of America, Chicago (B)
Crown Paper Box Corp., Indianapolis (B)
Essex Paper Box Mfg. Co., Newark, N. J. (B)
•Fibreboard Paper Products Corp., San Francisco (B)
•Gardner Div., Diamond National Corp., Middletown, Ohio (B)
Green Bay Box Co., Green Bay, Wis. (A)
Grigsby Bros. Paper Box Mfrs., Portland, Ore. (B)
Holyoke Die Cut Card Co., Holyoke, Mass. (B)
•Lassiter, Div. Riegel Paper Corp., New York (B)
Lawson & Jones Ltd., London, Ont. (B)
Mankato Paper Box Co., Mankato, Minn. (B)
•Marathon, Div. American Can Co., Menasha, Wis. (B)
Mead Containers, Div. Mead Corp., Cincinnati (A)
Mead Packaging, Div. Mead Corp., Atlanta, Ga. (B)
Reliance Paper Box Co., Philadelphia (A, B)
St. Regis Paper Co., New York (A)
San Jose Paper Box Co., Santa Clara, Calif. (B)
Somerville Ltd., London, Ont. (B)
Spear Box Co., New York (B)
Trautmann, Bailey & Blampey, New York (B)
United Container Co., Philadelphia (A)
Weyerhaeuser Co., Boxboard & Folding Carton Div., Chicago (B)

CONTAINERS, SEMI-RIGID, TRANSPARENT

A. Extruded
B. Fabricated
C. Thermoformed

Editorial information, Div. II Sec. 8

Abest Paper Box Co., New York (B, C)
•American Packaging Corp., Cleveland (C)
American Paper Box Co., Montreal, Que. (B, C)
•Anchor Plastics Co., Long Island City, N. Y. (A)
Averil, Inc., Miami, Fla. (C)
Bardes, A. G., Co., Milwaukee (B, C)
Bel-Art Products, Pequannock, N. J. (B)
Bishop, Robert B., Inc., Chicago (C)
Blank, Arthur, & Co., Boston (B)
Borkland Mfg. Co., Marion, Ind. (C)
Box Shop, Inc., New Haven, Conn. (B, C)
Cal-Plastics, San Francisco (B, C)
Chanal Plastics Corp., Rego Park, N. Y. (C)
Chicago Paper Box Co., Chicago (B)
Clear-Vu Packaging Corp., New York (C)
Conex Div., Illinois Tool Works, Des Plaines, Ill. (B, C)
Container Corp. of America, Chicago (B)
•Creative Packaging, Inc., Indianapolis (B, C)
Crystal Preforming & Packaging, Inc., Warsaw, Ind. (C)
Custom Merchandise Corp., Brooklyn, N. Y. (C)
Davis, S. H., Paper Box Co., Toledo, Ohio (B, C)
DeWitt Plastics, Auburn, N. Y. (B, C)
•Diamond Plastics Industries, Div. Creative Packaging, Inc., Roanoke, Va. (C)
Eastern Vacuum Forming Co., Asbury Park, N. J. (C)
Essex Paper Box Mfg. Co., Newark, N. J. (B)
•Extruded Plastics, Inc., Norwalk, Conn. (A)
Fabri-Kal Corp., Kalamazoo, Mich. (C)
•Flex Products Corp., Rutherford, N. J. (B)
Formed Container Corp., Sub. Phillips Petroleum Co., Orangeburg, N. Y. (C)
•Gardner Div., Diamond National Corp., Middletown, Ohio (B)
Gigante Paper Box Co., Jersey City, N. J. (C)
Harkin Affiliates, Inc., New York (C)
Haveg Industries, Inc., Blow-Molding Div., Bound Brook, N. J. (B)
•Hedwin Corp., New York (C)
Heidi Plastics Corp., Yonkers, N. Y. (C)
Hermsdorf Industries, Inc., Manchester, N. H. (C)
Highland Printers & Plastic Molders, Pasadena, Calif. (C)
Holly Plastics Co., Warren, Mich. (C)
Hopple Plastics, Inc., Cincinnati (C)
Imperial Paper Box Corp., Brooklyn, N. Y. (B, C)
•J-E Plastics Mfg. Corp., Yonkers, N. Y. (B, C)
Landsberger Plastics Co., New York (B, C)
•Lebanon Paper Box Mfg. Co., Lebanon, Pa. (B)
•Lermer Plastics, Inc., Garwood, N. J. (C)
Lily-Tulip Cup Corp., New York (C)
Lucid Containers, New York (B)
Mankato Plastic Co., Mankato, Minn. (B, C)
Manufacturers Box Co., Bridgeport, Conn. (B, D)
Martin, Fair, Boxes, Inc., Concord, N. C. (B, C)
Mutual Plastic Mold Corp., South Gate, Calif (B)
National Packaging Corp., Fort Wayne, Ind. (C)
Newark Paper Box Co., Newark, N. J. (B)
North Star Industries, Inc., Minneapolis (C)
Pantasote Co., Panta-Pak Div., New York (C)
•Paper Package Co., Div. Creative Packaging, Inc., Indianapolis (B, C)
•Plastic Artisans, Inc., Port Chester, N. Y. (C)
Plastic Enterprises, College Point, N. Y. (C)
Plastic Packaging Corp., Chicopee, Mass. (C)
Plastic Parts Corp., Toledo, Ohio (C)
•Plastofilm, Inc., Wheaton, Ill. (B, C)
•Plaxall, Inc., Long Island City, N. Y. (C)
Prepac, Inc., New York (B)
Preservation Packaging, Inc., Hillside, N. J. (C)
Rap Industries, Inc., Minneapolis (C)
Reliance Paper Box Co., Philadelphia (B, C)
Round Tubes & Cores Co., Chicago (B)
S-L-M Plastics, Perth Amboy, N. J. (B)
San Jose Paper Box Co., Santa Clara, Calif. (C)
Sefton Fibre Can Div., Container Corp. of America, St. Louis, Mo. (C)
Shaw Paper Box Co., Pawtucket, R. I. (B, C)
Shaw-Randall Co., Pawtucket, R. I. (B, C)
Somerville Ltd., London, Ont. (C)
Southern Plastic Products Co., Riviera Beach, Fla. (C)
•Standard Packaging Corp., New York (C)
Syracuse Plastics, Syracuse, N. Y. (C)
T. O. Plastics, Inc., Minneapolis (C)
Thermo-Plastic Products Co., San Carlos, Calif. (C)
Tobin-Howe Paper Box Co., Clifton, N. J. (B)
Tubophane S.A., Paris, France (B, C)
Twinpak Ltd., Lachine, Que. (B, C)
United States Box Co., Brooklyn, N. Y. (B, C)
Universal Jewelry Case Co., Chicopee, Mass. (B, C)
Valley-National Corp., Milldale, Conn. (B, C)
Warneke Paper Box Co., Denver, Colo. (B)
•Warner Brothers Co./Packaging, Bridgeport, Conn. (B, C)
Weaver Packaging Co., Montrose, Calif. (B, C)
Weinman Brothers, Inc., Chicago (B)
Whyte Mfg. Co., New York (C)
Williams Brothers Paper Box Co., St. Joseph, Mich. (B)
Wrapture, Inc., Flushing, N. Y. (B, C)
Zumbiel, C. W., Co., Cincinnati (B)

CONTAINERS, SHIPPING, WEATHERPROOF

(V-Boxes)

A. Corrugated
B. Solid Fibre

Editorial information, Div. V Sec. 17

Abest Paper Box Co., New York (A)
Able Container Co., Chicago (A)
Albemarle Paper Mfg. Co., Richmond, Va. (A)
Bell, Edwin, Cooperage Co., Pittsburgh (A)
Bell Fibre Products Co., Marion, Ind. (A)
Bicknell & Fuller Paper Box Co., Boston (A)
Binghamton Container Co., Binghamton, N. Y. (A)
Boise Cascade Container Corp., Wallula, Wash. (A)
Commerce Packaging Corp., Stamford, Conn. (A)
Commercial Corrugated Container Corp., Brooklyn, N. Y. (A, B)
Consolidated Water Power & Paper Co., Wisconsin Rapids, Wis. (A, B)
Container Corp. of America, Chicago (A, B)
•Continental Can Co., Corrugated Container Div., New York (A)
Cornell Paperboard Products Co., Div. St. Regis Paper Co., Milwaukee (A, B)
Diamond Paper Box Co., Philadelphia (A)
Dorey Corrugated Paper Products, Inc., Scottsville, N. Y. (A)
•Fibreboard Paper Products Corp., San Francisco (A, B)
Flintkote Co., Los Angeles (B)
Gaylord Container Div., Crown Zellerbach Corp., St. Louis, Mo. (A, B)
Georgia-Pacific Paper Co., Portland, Ore. (A)
Green Bay Box Co., Green Bay, Wis. (A)
•Hoerner Boxes, Inc., Keokuk, Iowa (A)
Hollinger Corp., Arlington, Va. (A, B)
Inland Container Corp., Indianapolis (A)
•International Paper Co., New York (A)
Jones, Jesse, Box Corp., Philadelphia (A)
Kankakee Container Co., Kankakee, Ill. (A)
Lawless Brothers Container Corp., No. Tonawanda, N. Y. (A)
Lawrence Paper Co., Lawrence, Kan. (A)
Longview Fibre Co., Longview, Wash. (A, B)
Martin Bros. Container & Timber Products Corp., Toledo, Ohio (B)
Massillon Container Co., Navarre, Ohio (A)
Mead Containers, Div. Mead Corp., Cincinnati (A, B)
Metal Edge Industries, Barrington, N. J. (A, B)
Midland Container Corp., St. Louis, Mo. (A, B)

Nash-Hammond, El Monte, Calif. (B)
National Vulcanized Fibre Co., Wilmington, Del. (B)
New England Container Co., Chicopee, Mass. (A)
•Olin, Packaging Div., Forest Products Operations, W. Monroe, La. (A)
•Owens-Illinois Glass Co., Toledo, Ohio (A)
•Packaging Corp. of America, Evanston, Ill. (A, B)
Republic Container Corp., Jersey City, N. J. (A)
River Raisin Paper Co., Div. Union Bag-Camp Paper Corp., Monroe, Mich. (A, B)
St. Regis Paper Co., New York (A)
Shillington Box & Lumber Co., St. Louis, Mo. (A)
Southern Special Products, Richmond, Va. (B)
Stone Container Corp., Chicago (A)
Tri-Wall Containers, Inc., New York (A)
Union Bag-Camp Paper Corp., New York (A, B)
United Container Co., Philadelphia (A, B)
U. S. Corrugated Fibre Box Co., Indianapolis (A)
Wabash Fibre Box Co. Div., The Weston Paper & Mfg. Co., Terre Haute, Ind. (A)
Weyerhaeuser Co., Shipping Container Div., Chicago (A, B)

CUPS, PAPER

(Liquid-Holding)

Editorial information, Div. II Sec. 6

American Lace Paper Co., Milwaukee
•Continental Can Co., Bondware Div., Newark, N. J.
Dixie Cup Div., American Can Co., Easton, Pa.
Herz Mfg. Div., American Seal-Kap Corp., New York
KVP Sutherland Paper Co., Kalamazoo, Mich.
Kansas City Container Co., Kansas City, Mo.
•Keyes Fibre Co., Waterville, Maine
Lily-Tulip Cup Corp., New York
Mead Packaging, Div. Mead Corp., Liquid-Tight Container Plant, Lawrence, Mass.
Mid-West-Pak Corp., Belvidere, Ill.
National Mfg. Co., Kansas City, Mo.
Sayford Corp., Litchfield, Conn.
Sealright Co., Fulton, N. Y.
Smith-Lee Co., Oneida, N. Y.
Solo Cup Co., Chicago
•Standard Packaging Corp., Normandie Cup Div., Alexandria, Va.
•United States Envelope Co., Springfield, Mass.

CUPS, PAPER OR FOIL

(For Candy & Baking)

Editorial information, Div. I Sec. 3, 4, Div. II Sec. 9

•Aluminum Co. of America, Pittsburgh
American Lace Paper Co., Milwaukee
•Continental Can Co., Folding Carton & Drum Div., New York
Fluted Paper Products Co., So. Norwalk, Conn.
G. & B. Bakers Supply Corp., No. Bergen, N. J.
Herz Mfg. Div., American Seal-Kap Corp., New York
KVP Sutherland Paper Co., Kalamazoo, Mich.
Lily-Tulip Cup Corp., New York
Mirro Aluminum Co., Manitowoc, Wis.
Penny Plate, Inc., Haddonfield, N. J.
•Reynolds Metals Co., Richmond, Va.
St. Regis Paper Co., New York
Sayford Corp., Litchfield, Conn.
Sealright Co., Fulton, N. Y.
Sherman Paper Products Co., Div. St. Regis Paper Co., Newton Upper Falls, Mass.
Smith-Lee Co., Oneida, N. Y.
•Standard Packaging Corp., Royal Lace Div., Fort Wayne, Ind.
Star Aluminium Co., Wolverhampton, England
Youse, C. J., Co., Baltimore, Md.

DISPLAYS

A. Cabinet
B. Counter (Merchandise & Dispensing)
C. Floor Stand
D. Lithographed
E. Metal, Sheet
F. Motion
G. Plastic
H. Wire

Editorial information, Div. IV Sec. 16

Abest Paper Box Co., New York (B, C, D, G)
Abt Lithographers, Inc., Branford, Conn. (B, D)
Ackermann, G. A., Printing Co., Cicero, Ill. (D)
Alfa Mfg. Co., Chicago (G)
Alsten Co., Jersey City, N. J. (B, F, G, H)
American Paper Box Co., Montreal, Que. (B, D)
Arkay Printing Co., New York (B, D)
Artmor Plastics Corp., Cumberland, Md. (B, G)
Badger Carton Co., Milwaukee (A, B)
Bagphane Corp., Flushing, N. Y. (E, G)
Barnett, Samuel, Co., Philadelphia (B)
Berkowitz, Leon L., Co., Philadelphia (B, C, D, F, G, H)
Binghamton Container Co., Binghamton, N. Y. (B, C)
Bishop, Robert B., Inc., Chicago (G)
Blank, Arthur, & Co., Boston (G)
Bock, Frank, New York (B, D)
Bolling Industries, Inc., Scranton, Pa. (B, D, G)
Borkland Mfg. Co., Marion, Ind. (D, G)
Box Shop, Inc., New Haven, Conn. (B, G)
Boxcraft Paper Box Co., Oakland, Calif. (B)
Boxmakers, Inc., Westfield, Mass. (B)
•Bradley Associates, Inc., Chicago (G)
Brandau Craig Dickerson Co., Nashville, Tenn. (B, D, F)
Brett Lithographing Co., Long Island City, N. Y. (B, C, D, F, G)
Brooks & Porter, Inc., New York (A, B, C, D, E, F, G, H)
Brothers Paper Box Co., Sioux City, Iowa (A, B)
Bufkor, Inc., Buffalo, N. Y. (B, F, H)
Burton Packaging Co., Brooklyn, N. Y. (B, C)
Cal-Plastics, San Francisco (G)
Castle Offset Printing Corp., Norwalk, Ohio (D)
Chanal Plastics Corp., Rego Park, N. Y. (B, C, F, G)
•Chaspec Mfg. Co., Greenwich, Conn. (A, B, C, D, E, F, G, H)
Clark, J. L., Mfg. Co., Rockford, Ill. (D, E)
Color Reproductions, Inc., Union, N. J. (B, C, F)
Comly-Gillam Carton Corp., Philadelphia (B)
Consolidated Lithographing Corp., Carle Place, N. Y. (B, C, D, F, G, H)
Consolidated Lithographing Div., Somerville Ltd., Montreal, Que. (D)
Container Corp. of America (B, C, F)
•Continental Can Co., Corrugated Container Div., New York (A, B, C, D)
Copeland Displays, Inc., New York (A, B, C, E, F, G, H)
Cornell Paperboard Products Co., Div. St. Regis Paper Co., Milwaukee (C)
Corro-Lith Corp., Long Island City, N. Y. (B, C, D, F)
Crown Paper Box Corp., Indianapolis (B)
Crystal-X Corp., Lenni Mills, Pa. (G)
Custom Merchandise Corp., Brooklyn, N. Y. (A, B, C, D, G)
Display Finishing Co., Long Island City, N. Y. (B, C, D, F)
Dorsey Display Corp., New York (A, B, C, D, E, F, G, H)
Dunning, J. H., Corp., Darien, Conn. (A, B, C)
Eastern Vacuum Forming Co., Asbury Park, N. J. (B, G)
Edinger-Wyckoff, Inc., Stroudsburg, Pa. (A, B, C, F, H)
Einson-Freeman Co., Long Island City, N. Y. (B, C, D)
Emeloid Co., Sub. Addressograph-Multigraph Corp., Hillside, N. J. (D, G)
Fabri-Kal Corp., Kalamazoo, Mich. (G)
Feder Industries, Inc., New York (B)
Federal Carton Corp., No. Bergen, N. J. (D)
Foxon Co., Providence, R. I. (B)
Friedel, J. F., Paper Box Co., E. Syracuse, N. Y. (B)
Fuller Displays, Inc., Long Island City, N. Y. (B, C, D, F, G, H)
Gabe-Bert Crafts, Inc., Yonkers, N. Y. (A, B, D)
•Gardner Div., Diamond National Corp., Middletown, Ohio (B, D)
Gray-Way Advertising Displays, Inc., Milwaukee (A, B, C, D, E, F, G, H)
Haveg Industries, Inc., Blow-Molding Div., Bound Brook, N. J. (G)
Hermsdorf Industries, Inc., Manchester, N. H. (G)
Hill & Neumann Co., Jersey City, N. J. (B)
Hinde & Dauch Div., West Virginia Pulp & Paper Co., Sandusky, Ohio (B, C)
Hopple Plastics, Inc., Cincinnati (G)
•Howell, F. M., & Co., Elmira, N. Y. (B, D)
Industrial Lithographic Co., Brooklyn, N. Y. (B, C, D, F)
Injection Molding Corp., New York (G)
•Jackmeyer Corp., New York (D, G)
Kalamazoo Paper Box Corp., Kalamazoo, Mich. (B, D)
Kay, Inc., New York (A, B, C, E, F, G, H)
Landau Metal Products Corp., Long Island City, N. Y. (A, B, C, D, E, H)
Landsberger Plastics Co., New York (A, B, G)
Lansky Die Cutting Corp., Brooklyn, N. Y. (B, C, F)
Lanzit Corrugated Box Co., Chicago (B, C)
Lee-Hy Plastics, Inc., Buffalo, N. Y. (G)
Leominster Paper Box Co., Leominster, Mass. (A, B, C)
Lustra-Cite Industries, Inc., Brooklyn, N. Y. (A, B, C, E, G, H)
Mankato Paper Box Co., Mankato, Minn. (B, G)
Martin, Fair, Boxes, Inc., Concord, N. C. (B, G)
Masta Displays, Inc., New York (B, F)
Mautner Co., New York (B, F, H)
Mayer, Frank, & Associates, Inc., Milwaukee (B, C, F)
Mayland Co., New York (A, B, C, E, F, G, H)

Mead Containers, Div. Mead Corp., Cincinnati (B, C, G)
Metaline Products Co., So. Amboy, N. J. (B, C, D, E, F, G, H)
•Milprint, Inc., Milwaukee (B, D)
New England Container Co., Chicopee, Mass. (B, C)
Newark Paper Box Co., Newark, N. J. (B)
Nielsen Lithographing Co., Cincinnati (D)
Nussbaum Novelty Mfg. Co., Berne, Ind. (B)
OEL, Inc., Elizabeth, N. J. (G)
Oberly & Newell Lithograph Corp., New York (B, C, D, F, G, H)
•Olin, Packaging Div., Forest Products Operations, W. Monroe, La. (B, C)
Package & Display Corp., Brooklyn, N. Y. (A, B, C, D, F, G, H)
•Packaging Corp. of America, Evanston, Ill. (B, C)
Parrot Litho A/S, Copenhagen, Denmark (D)
Penn Lithographing Co., Philadelphia (D)
Philipp Lithographing Co., Grafton, Wis. (D)
Pioneer Folding Box, Inc., Chicopee, Mass. (B)
Planned Displays, Inc., Leominster, Mass. (A, B, C)
•Plas-Tech, Inc., St. Paul, Minn. (G)
•Plastic Artisans, Inc., Port Chester, N. Y. (B, G)
Plastic Enterprises, College Point, N. Y. (B, G)
Plastic Parts Corp., Toledo, Ohio (B, G)
Plasticon Corp., Minneapolis (G)
Premier Packages, Inc., St. Louis, Mo. (B)
Production Metal Products Co., Chicago (A, B, C, D, E, F, G, H)
Progress Lithographing Co., Cincinnati (D)
Ravenware Co., Brooklyn, N. Y. (B, C, E, F, H)
Regent Specialties, Div. Angle Genessee Corp., Rochester, N. Y. (A, B, C, F, C, H)
Robertson Paper Box Co., Montville, Conn. (B)
Rochester Lithograph Mfg. Corp., Rochester, N. Y. (D)
Rothchild Printing Co., New York (D)
St. Regis Paper Co., New York (B, C)
Schmidt Lithograph Co., San Francisco (A, B, C, D, F, G)
Shaw-Randall Co., Pawtucket, R. I. (B, C)
Somerville Ltd., London, Ont. (A, B, C, D, E, F, G, H)
Southern Plastic Products Co., Riviera Beach, Fla. (B, F, G)
Spielman Co., Philadelphia (D)
•Standard Packaging Corp., Bradley & Gilbert Div., Louisville, Ky. (B, D)
Stone Container Corp., Chicago (B, C)
Thomson-Leeds Co., New York (A, B, C, D, E, F, G, H)
Thorpe, F. M., Mfg. Co., Lamar, Mo. (B, C, E, H)
Tubophane S.A., Paris, France (G)
United Container Co., Philadelphia (A, B, C, D, F, G, H)
United States Box Co., Brooklyn, N. Y. (B, G)
•United States Printing & Lithograph, Div. Diamond National Corp., New York (B, C, D, F)
Universal Folding Box Co., Hoboken, N. J. (B)
Utility Printing Co., Carlstadt, N. J. (B, D, F)
Valley-National Corp., Milldale, Conn. (G)
Weil's, David, Sons Lithographic Co., Brooklyn, N. Y. (B, D)
Whyte Mfg. Co., New York (G)
Woolf, Irving, & Co., Chicago (B, C, D, F, G, H)
Wrapture, Inc., Flushing, N. Y. (G)
York Display Finishing Co., Brooklyn, N. Y. (B, C, F)
Zuckerman, Joseph, Inc., Yonkers, N. Y. (B, D)

DRUMS

A. Fibre
B. Metal
C. Plastic
D. Plywood

Editorial information, Div. V Sec. 17

•Aluminum Co. of America, Pittsburgh (B)
Bennett Industries, Inc., Peotone, Ill. (A, B)
Brilhart Plastics Corp., Mineola, N. Y. (C)
Climax Fibre Drum Co., Carthage, N. Y. (A)
Consolidated Paper Co., Monroe, Mich. (A)
•Continental Can Co., Folding Carton & Drum Div., New York (A)
•Continental Can Co., Metal Div., New York (B)
Crystal-X Corp., Lenni Mills, Pa. (C)
Delaware Barrel & Drum Co., Wilmington, Del. (C)
DeVilbiss Co., Metal Fabricating Div., Detroit (B)
Eastern Steel Barrel Corp., Bound Brook, N. J. (B)
Eclipse Plastic Industries, Inc., Sarasota, Fla. (C)
Fetter Steel Barrel Corp., Buffalo, N. Y. (B)
Fibre Drum Co., Chicago (A)
Geuder, Paeschke & Frey Co., Milwaukee (B)
•Greif Bros. Cooperage Corp., Delaware, Ohio (A, B, D)
Greif Bros. Cooperage Corp., Seymour & Peck Div., Blue Island, Ill. (A, B, C, D)
Haveg Industries, Inc., Blow-Molding Div., Bound Brook, N. J. (C)
•Hedwin Corp., New York (C)
Industrial Steel & Fibre Ltd., Montreal, Que. (A)
Inland Steel Container Co., Div. Inland Steel Co., Chicago (B)
Jones & Laughlin Steel Corp., Pittsburgh (B)
Master Package Corp., Owen, Wis. (A)
Mead Board Sales, Inc., Cincinnati (A)
Monmouth Container Corp., Matawan, N. J. (A)
Nash-Hammond, Inc., El Monte, Calif. (A)
National Vulcanized Fibre Co., Wilmington, Del. (A)
Newark Paper Box Co., Newark, N. J. (C)
Ohio Corrugating Co., Warren, Ohio (B)
Plasticon Corp., Minneapolis (C)
Plyfiber Container Corp., Elizabeth, N. J. (A)
Republic Steel Corp., Container Div., Niles, Ohio (B)
Rheem Mfg. Co., Linden, N. J. (A, B)
Sauer Cooperage Co., Wyandotte, Mich. (B)
Sonoco Products Co., Hartsville, S. C. (A)
Southline Metal Products Co., Houston, Texas (B)
Spenzer Container Corp., Greenville, Pa. (A)
Standard Can Corp., Leetsdale, Pa. (B)
Thornton, F. C., Co., Cleveland (B)
U. S. Hoffman Can Corp., Brooklyn, N. Y. (B)
United States Steel Products Div., United States Steel Corp., New York (B)
Virginia Barrel Div., The Greif Bros. Cooperage Corp., Staten Island, N. Y. (A, B)
Vulcan Containers (Canada) Ltd., Rexdale, Ont. (B)
Vulcan Steel Container Co., Birmingham, Ala. (B)

ENVELOPES

A. Clasp
B. Cloth & Cotton-Lined Paper
C. Packaging (Opaque)
D. String & Button Closure
E. Transparent

(See also Bags)

Editorial information, Div. II Sec. 7

Acme Cellophane Converting Corp., Temple City, Calif. (E)
Acme Tag Co., Minneapolis (E)
American Kleer-Vu Plastics, Inc., New York (E)
Artmor Plastics Corp., Cumberland, Md. (E)
Bagphane Corp., Flushing, N. Y. (E)
Bardes, A. G., Co., Milwaukee (E)
Bellen Co., Chicago (E)
Bemis Bro. Bag Co., St. Louis, Mo. (B)
Blank, Arthur, & Co., Boston (E)
Blossom Mfg. Co., Brooklyn, N. Y. (E)
Boston Envelope Co., Dedham, Mass. (A, C, D)
COSECO, Los Angeles (E)
Calumet Carton Co., Homewood, Ill. (C)
Cello Bag Co., Seattle, Wash. (E)
Cello-Pack, Inc., Buffalo, N. Y. (E)
•Cellu-Craft Products Corp., New Hyde Park, N. Y. (E)
Cohoes Carrybag Co., Cohoes, N. Y. (A, D)
Colonial Envelope Co., Brooklyn, N. Y. (E)
•Cottonluxe Mfg. Co., New York (B)
Crystal Tube Corp., Chicago (E)
Crystal-X Corp., Lenni Mills, Pa. (E)
Diaphane Corp., Philadelphia (E)
Dickinson, John, & Co., Hemel Hempstead, Herts., England (A, B, C, D, E)
Dura-Lee Corp., Kansas City, Kan. (E)
Empire Specialties, Inc., Brooklyn, N. Y. (B)
Equitable Paper Bag Co., Long Island City, N. Y. (A, C, D, E)
Excelsior Transparent Bag Mfg. Co., Yonkers, N. Y. (C, E)
Flexicraft Industries, Inc., New York (A, E)
Grace, W. R., & Co., Cryovac Div., Cambridge, Mass. (E)
Herz Mfg. Div., American Seal-Kap Corp., New York (E)
House of More, San Francisco (E)
Jacobson, S. I., Mfg. Co., Chicago (B, C, E)
Kage Co., Manchester, Conn. (E)
Kellogg Container Div., United States Envelope Co., Springfield, Mass. (C, E)
Kendall Mfg. Co., Milwaukee (E)
Kennedy Car Liner & Bag Co., Shelbyville, Ind. (C, D, E)
Keystone Packaging Service, Inc., Phillipsburg, N. J. (E)
•Lassiter, Div. Riegel Paper Corp., New York (E)
Lion Packaging Products Co., Hicksville, N. Y. (B)
Master Packaging, Inc., Tampa, Fla. (A, D, E)
Melrose Packaging Corp., Flushing, N. Y. (B, C, E)
Mil-Jan Bag Co., Muskegon, Mich. (C)
•Milprint, Inc., Milwaukee (E)

Neostyle, Inc., Birmingham, Mich. (C, E)
New Jersey Transparent Co., Brooklyn, N. Y. (E)
New York Packaging Corp., Brooklyn, N. Y. (E)
Newark Paper Box Co., Newark, N. J. (E)
•Northland Bag Corp., Yonkers, N. Y. (E)
•Oneida Paper Products, Inc., Clifton, N. J. (C, E)
Orchard Paper Co., St. Louis, Mo. (C)
Pacific Process Printing Co., Los Angeles (E)
Package Printing Co., W. Springfield, Mass. (E)
Packaging Pioneers, Tuckahoe, N. Y. (E)
Pexco Bag Mfg. Co., Toledo, Ohio (E)
Pioneer Valley Plastics Co., Agawam, Mass. (A, D, E)
•Plastic Packaging Co., Chicago (C, E)
•Plastofilm, Inc., Wheaton, Ill. (E)
Poly Plastic Products, Inc., Paterson, N. J. (E)
Polycraft Co., Montreal, Que. (E)
Polyfab Co., Los Angeles (E)
Polyflex Bag & Container, Inc., Johnstown, N. Y. (E)
Prepac, Inc., New York (C, E)
Puritan Packaging Corp., Columbus, Ohio (E)
Rap Industries, Inc., Minneapolis (C, E)
Reliance Plastic & Chemical Corp., Paterson, N. J. (E)
Richmond Paper Co., Highland, Calif. (C, E)
•Riegel Paper Corp., New York (C, E)
St. Regis Paper Co., New York (A, C, D, E)
Sealcraft Products Corp., Milwaukee (E)
Shore Line Industries, Inc., Clinton, Conn. (E)
Sirco Mfg. Corp., New York (C, E)
Speedmaster Packaging Corp., New York (E)
•Standard Packaging Corp., Quality Park Box Co., St. Paul, Minn. (A, C, D)
Stecher-Traung Lithograph Corp., Rochester, N. Y. (C)
Swartz Mfg. Co., Dorchester, Mass. (E)
Talmadge Printing Co., New York (A, B, D)
Tension Envelope Corp., Kansas City, Mo. (A, C, D, E)
Tower Packaging Co., Wheeling, Ill. (E)
Union Transbag Co., Providence, R. I. (E)
•United States Envelope Co., Springfield, Mass. (A, C, D, E)
W. E. W. Container Co., Brooklyn, N. Y. (E)
•West Virginia Pulp & Paper Co., New York (A, B, C, D, E)
Wrapture, Inc., Flushing, N. Y. (C, E)

JARS

A. Glass
B. Home Canning
C. Opal
D. Plastic

Editorial information, Div. II Sec. 8, 10

Air Formed Products Corp., Sub. Bemis Bro. Bag Co., Nashua, N. H. (D)
Alfa Mfg. Co., Chicago (D)
Alladin Plastics, Inc., Gardena, Calif. (D)
American-Wheaton Glass Corp., Millville, N. J. (A)
•Anchor Hocking Glass Corp., Lancaster, Ohio (A, C)
•Armstrong Cork Co., Lancaster, Pa. (A)
•Ball Brothers Co., Muncie, Ind. (A, B)
•Bradley Associates, Inc., Chicago (D)
Brockway Glass Co., Brockway, Pa. (A)
Carr-Lowrey Glass Co., Baltimore, Md. (A, C)
•Celluplastics, Inc., Sub. Brockway Glass Co., Newark, N. J. (D)
•Continental Can Co., Hazel-Atlas Glass Div., Wheeling, W. Va. (A, B, C)
Creative Plastic Containers, Culver City, Calif. (D)
Dominion Glass Co., Montreal, Que. (A, B, C)
Eclipse Plastic Industries, Inc., Sarasota, Fla. (D)
•Erno Products Co., Philadelphia (A, B, C, D)
Frank Plastics Corp., Detroit (D)
Glenshaw Glass Co., Glenshaw, Pa. (A, B)
Haveg Industries, Inc., Blow-Molding Div., Bound Brook, N. J. (D)
•Imco Container Co., Kansas City, Mo. (D)
Injection Molding Corp., New York (D)
Kerr, Alexander H., & Co., Los Angeles (A, B)
Knox Glass, Inc., Knox, Pa. (A, B)
•Lermer Plastics, Inc., Garwood, N. J. (D)
Maryland Glass Corp., Baltimore, Md. (A)
•Metro Glass, Div. National Dairy Products Corp., Jersey City, N. J. (A)
Mutual Plastic Mold Corp., South Gate, Calif. (D)
Northwestern Glass Co., Seattle, Wash. (A, B)
Olympic Plastics Co., Los Angeles (D)
•Owens-Illinois Glass Co., Toledo, Ohio (A, B, D)
Parkway Plastics, Inc., New Market, N. J. (D)
•Pennsylvania Glass Products Co., Pittsburgh (A)
•Plas-Tech, Inc., St. Paul, Minn. (D)
Plastic Assembled Products, Inc., Baltimore, Md. (C, D)
Thatcher Glass Mfg. Co., New York (A, B, C)
Wheaton Glass Co., Millville, N. J. (A, C, D)
Whyte Mfg. Co., New York (D)
Wilpet Tool & Mfg. Co., Kearny, N. J. (D)
Wilson Plastic Container Corp., Brooklyn, N. Y. (D)

PADDED SHIPPING BAGS

(See Containers, Insulated)

PAILS, STEEL

Editorial information, Div. V Sec. 17

Bennett Industries, Inc., Peotone, Ill.
•Central Can Co., Chicago
•Continental Can Co., Metal Div., New York
Ellisco, Inc., Philadelphia
Frabill Mfg. Co., Milwaukee
Geuder, Paeschke & Frey Co., Milwaukee
Inland Steel Container Co., Div. Inland Steel Co., Chicago
Jones & Laughlin Steel Corp., Pittsburgh
Milton, George A., Can Co., Brooklyn, N. Y.
Ohio Corrugating Co., Warren, Ohio
Republic Steel Corp., Container Div., Niles, Ohio
Rheem Mfg. Co., Linden, N. J.
Southline Metal Products Co., Houston, Texas
Standard Can Corp., Leetsdale, Pa.
Thompson Can Co., Dallas, Texas
U. S. Hoffman Can Corp., Brooklyn, N. Y.
United States Steel Products Div., United States Steel Corp., New York
Vulcan Containers (Canada) Ltd., Rexdale, Ont.
Vulcan Steel Container Co., Birmingham, Ala.

POUCHES, COOK-IN

Editorial information, Div. II Sec. 7

Bagcraft Corp. of America, Chicago
Beacon Paper Bag Co., E. Paterson, N. J.
Boyertown Packaging Service Corp., Boyertown, Pa.
COSECO, Los Angeles
Cadillac Products, Inc., Warren, Mich.
Canada Foils, Ltd., Toronto, Ont.
Cello Bag Co., Seattle, Wash.
•Cellu-Craft Products Corp., New Hyde Park, N. Y.
•Continental Can Co., Flexible Packaging Div., Mt. Vernon, Ohio
Crown Zellerbach Corp., Western-Waxide Div., San Leandro, Calif.
Crystal Tube Corp., Chicago
Durapak Mfg. Co., Baltimore, Md.
Equitable Paper Bag Co., Long Island City, N. Y.
Excelsior Transparent Bag Mfg. Co., Yonkers, N. Y.
Formed Container Corp., Sub. Phillips Petroleum Co., Orangeburg, N. Y.
House of More, San Francisco
Kehr Products Co., Willow Grove, Pa.
•Lassiter, Div. Riegel Paper Corp., New York
Lustour Corp., St. Louis, Mo.
Melrose Packaging Corp., Flushing, N. Y.
Mil-Jan Bag Co., Muskegon, Mich.
•Milprint, Inc., Milwaukee
Modern Packaging, Inc., Mt. Holly, N. J.
New Jersey Transparent Co., Brooklyn, N. Y.
•Oneida Paper Products, Inc., Clifton, N. J.
Packaging Pioneers, Inc., Tuckahoe, N.Y.
Packaging Products, Inc., Kansas City, Mo.
Pexco Bag Mfg. Co., Toledo, Ohio
Polycraft Co., Montreal, Que.
Quatrum Corp., Chicago
Rap Industries, Inc., Minneapolis
•Reynolds Metals Co., Richmond, Va.
Richmond Paper Co., Highland, Calif.
•Riegel Paper Corp., New York
Rollprint Products Corp., Chicago
Sealcraft Products Corp., Milwaukee
Spec-Fab Co., Riverton, N. J.
Speedmaster Packaging Corp., New York
•Standard Packaging Corp., New York
Swartz Mfg. Co., Dorchester, Mass.
Tower Packaging Co., Wheeling, Ill.
W. E. W. Container Co., Brooklyn, N. Y.
Wrapture, Inc., Flushing, N. Y.

TRAYS, CELLOPHANE OVERWRAPPED

Editorial information, Div. II Sec. 6

Acme Folding Box Co., Brooklyn, N. Y.
American Paper Box Co., Montreal, Que.
Barnett, Samuel, Co., Philadelphia
Bellen Co., Chicago
Bestpak, Inc., Natick, Mass.
Burton Packaging Co., Brooklyn, N. Y.
Chicago Carton Co., Div. Waldorf Paper Products Co., Chicago
Columbus Paper Box Co., Columbus, Ohio
Comly-Gillam Carton Corp., Philadelphia
Consolidated Lithographing Div., Somerville Ltd., Montreal, Que.
Container Corp. of America, Chicago
Cooper Paper Box Div., Clarkson Press, Inc., Buffalo, N. Y.
Crocker, H. S., Co., San Bruno, Calif.
Crown Zellerbach Corp., Western-Waxide Div., San Leandro, Calif.
Fabri-Kal Corp., Kalamazoo, Mich.
Formed Container Corp., Sub. Phillips Petroleum Co., Orangeburg, N. Y.
Gabe-Bert Crafts, Inc., Yonkers, N. Y.
Gleason Industries, El Segundo, Calif.
Heat Sealing Equipment Mfg. Co., Cleveland

Indianapolis Paper Container Corp., Indianapolis
Laminated Paper Products, Santa Clara, Calif.
Leedpak, Inc., New York
Mead Packaging, Div. Mead Corp., Atlanta, Ga.
Murnane Paper Co., Northlake, Ill.
Nelson, B. F., Mfg. Co., Minneapolis
Peerless Packages, Inc., Cleveland
Philadelphia Folding Box Co., Philadelphia
R E B Trays, Inc., Flourtown, Pa.
Randolph Paper Box Co., Div. Albemarle Paper Mfg. Co., Richmond, Va.
St. Regis Paper Co., New York
Shaw-Randall Co., Pawtucket, R. I.
Sherman Paper Products Corp., Div. St. Regis Paper Co., Newton Upper Falls, Mass.
Standard Folding Trays Corp., Jackson Heights, N. Y.
•Standard Packaging Corp., Fonda Container Div., St. Albans, Vt.
Toledo Paper Box Co., Toledo, Ohio
Unger Co., Cleveland
United Container Co., Philadelphia
Universal Folding Box Co., Hoboken, N. J.
Wrapture, Inc., Flushing, N. Y.
Zuckerman, Joseph, Inc., Yonkers, N. Y.

TRAYS, CRIMPED & PRESSED

(Fibre, Foil, Paperboard)

Editorial information, Div. II Sec. 6, 9

Bestpak, Inc., Natick, Mass.
Ellis Paperboard Products, Portland, Me.
•Fibreboard Paper Products Corp., San Francisco
Fluted Paper Products Co., So. Norwalk, Conn.
G. & B. Bakers Supply Corp., No. Bergen, N. J.
Gabe-Bert Crafts, Inc., Yonkers, N. Y.
•Gardner Div., Diamond National Corp., Middletown, Ohio
KVP Sutherland Paper Co., Kalamazoo, Mich.
•Marathon, Div. American Can Co., Menasha, Wis.
Mirro Aluminum Co., Manitowoc, Wis.
National Packaging Corp., Fort Wayne, Ind.
•Olin, Packaging Div., Forest Products Operations, W. Monroe, La.
Penny Plate, Inc., Haddonfield, N. J.
Potlatch Forests, Inc., Lewiston, Idaho
Raisin, John T., Corp., San Francisco
•Reynolds Metals Co., Richmond, Va.
St. Regis Paper Co., New York
•Standard Packaging Corp., Fonda Container Div., St. Albans, Vt.
Star Aluminium Co., Wolverhampton, England
Sweetnam, George H., Inc., Cambridge, Mass.
Unger Co., Cleveland
Zuckerman, Joseph, Inc., Yonkers, N. Y.

TRAYS, PLATFORMS & BASKETS

(Plastic)

Editorial information, Div. II Sec. 8

American Lace Paper Co., Milwaukee
•American Packaging Corp., Cleveland
Artmor Plastics Corp., Cumberland, Md.
Averil, Inc., Miami, Fla.
Bestpak, Inc., Natick, Mass.
Bishop, Robert B., Inc., Chicago
Bo-Mer Mfg. Co., Auburn, N. Y.
Borkland Mfg. Co., Marion, Ind.
Box Shop, Inc., New Haven, Conn.
Cel-Plastics, San Francisco
Chanal Plastics Corp., Rego Park, N. Y.
Clear-Vu Packaging Corp., New York
Como Plastics, Inc., Columbus, Ind.
•Creative Packaging, Inc., Indianapolis
Crystal-X Corp., Lenni Mills, Pa.
Curtis, S., & Son, Sandy Hook, Conn.
Custom Merchandise Corp., Brooklyn, N. Y.
Eastern Vacuum Forming Co., Asbury Park, N. J.
Fabri-Kal Corp., Kalamazoo, Mich.
Formed Container Corp., Sub. Phillips Petroleum Co., Orangeburg, N. Y.
•Gardner Div., Diamond National Corp., Middletown, Ohio
Heidi Plastics Corp., Yonkers, N. Y.
Holley Plastics Co., Warren, Mich.
Hopple Plastics, Inc., Cincinnati
•J. E. Plastics Mfg. Corp., Yonkers, N. Y.
Kaufman Hoag Co., New York
Landsberger Plastics Co., New York
•Packaging Components, Inc., New York
Pantasote Co., Panta-Pak Div., New York
Parkway Plastics, New Market, N. J.
•Plastic Artisans, Inc., Port Chester, N. Y.
Plastic Enterprises, College Point, N. Y.
Plastic Packaging Corp., Chicopee, Mass.
•Plastofilm, Inc., Wheaton, Ill.
Plast-O-Pak Corp., Leominster, Mass.
•Plaxall, Inc., Long Island City, N. Y.
Preservation Packaging, Hillside, N. J.
Rap Industries, Inc., Minneapolis
St. Regis Paper Co., New York
Service Engineers, Fort Worth, Tex.
Shaw-Randall Co., Pawtucket, R. I.
Southern Plastic Products Co., Riviera Beach, Fla.
Spenzer Container Corp., Greenville, Pa.
T. O. Plastics, Inc., Minneapolis
Twinpak Ltd., Lachine, Que.
United States Box Co., Brooklyn, N. Y.
Valley-National Corp., Milldale, Conn.
Wilson Plastic Container Corp., Brooklyn, N. Y.

TUBES, COLLAPSIBLE

A. *Metal*
B. *Plastic*

Editorial information, Div. II Sec. 8, 9

Atlantic Mfg. Co., Newark, N. J. (A)
Bradley-Sun Div., American Can Co., Union, N. J. (A, B)
Dale, John, Ltd., London, England (A, B)
Marken Plastic Corp., Los Angeles (B)
Michigan Collapsible Tube Co., Warren, Mich. (A)
Olympic Plastics Co., Los Angeles (B)
•Peerless Tube Co., Bloomfield, N. J. (A)
Sheffield Tube Corp., New London, Conn. (A)
Standard Collapsible Tube Co., Rochester, Pa. (A)
Thatcher Glass Mfg. Co., Plastic Container Div., New York (B)
Turner Tube Corp., Highland Park, N. J. (A)
Victor Industries Corp. of Calif., Chico, Calif. (A)
Victor Metal Products Corp., Newport, Ark. (A)
Wheeling Stamping Co., Wheeling, W. Va. (A)
White Metal Mfg. Co., Hoboken, N. J. (A)
•Wirz, A. H., Inc., Chester, Pa. (A)

TUBES, MOLDED PLASTIC

Editorial information, Div. II Sec. 8

Air Formed Products Corp., Sub. Bemis Bro. Bag Co., Nashua, N. H.
•Bradley Associates, Inc., Chicago
Brilhart Plastics Corp., Mineola, N. Y.
Container Corp. of America, Chicago
Frank Plastics Corp., Detroit
Garray Plastics, Inc., Kearny, N. J.
Hydrawlik Co., Roselle, N. J.
•Lerner Plastics, Inc., Garwood, N. J.
•Lusteroid Container Co., Maplewood, N. J.
Olympic Plastics Co., Los Angeles
Southern Plastics Co., Columbia, S. C.
Superior Plastics, Inc., Chicago
Swift Syringe Corp., Hingham, Mass.

TUBES, PAPER OR FIBRE

Editorial information, Div. I Sec. 6

Abest Paper Box Co., New York
American Paper Products Co., Philadelphia
Baxter, J. C., Co., Minerva, Ohio
Cambridge Paper Box Co., Cambridge, Mass.
Chicago Mailing Tube Co., Chicago
•Cin-Made Corp., Cincinnati
Climax Fibre Drum Co., Carthage, N. Y.
•Cleveland Container Co., Cleveland
Consolidated Box Co., Tampa, Fla.
Consolidated Water Power & Paper Co., Wisconsin Rapids, Wis.
Container Corp. of America, Chicago
•Creative Packaging, Inc., Indianapolis
Crescent Paper Tube Co., Covington, Ky.
Forsberg Paper Box Co., Madison, Wis.
Harcord Mfg. Co., Jersey City, N. J.
Indianapolis Paper Container Corp., Indianapolis
Industrial Steel & Fibre Ltd., Montreal, Que.
Kalamazoo Paper Box Corp., Kalamazoo, Mich.
Kehr Products Co., Willow Grove, Pa.
Maine Paper Tube Corp., Gardiner, Me.
Marshall Paper Tube Co., Randolph, Mass.
Master Package Corp., Owen, Wis.
Mead Board Sales, Inc., Cincinnati
Mullery Paper Packages, St. Paul, Minn.
National Mfg. Co., Kansas City, Mo.
•Niemand Brothers, Inc., Elmhurst, N. Y.
•Niemand Industries, Inc., Statesville, N. C.
Ohio Paper Products Co., Massillon, Ohio
•Paper Package Co., Div. Creative Packaging, Inc., Indianapolis
Paramount Paper Tube Co., Fort Wayne, Ind.
Penland Paper Converting Corp., Hanover, Pa.
Platt Corp., Baltimore, Md.
R. C. Can Co., St. Louis, Mo.
Round Tubes & Cores Co., Chicago
San Jose Paper Box Co., Santa Clara, Calif.
Sefton Fibre Can Div., Container Corp. of America, St. Louis, Mo.
Sonoco Products Co., Hartsville, S. C.
Spenzer Container Corp., Greenville, Pa.
Spitzer Paper Box Co., Toledo, Ohio
Stecker Paper Box Co., Detroit
Stone Container Corp., Chicago
Stone Paper Tube Co., Washington, D. C.
Stonington Paper Tube Co., Holyoke, Mass.
United Container Co., Philadelphia
Wabash Fibre Box Co. Div., The Weston Paper & Mfg. Co., Terre Haute, Ind.

TUBES, SEMI-RIGID, EXTRUDED PLASTIC

(Also Sleeves, Sheaths, Etc.)

•Anchor Plastics Co., Long Island City, N. Y.
•Extruded Plastics, Inc., Norwalk, Conn.

TUMBLERS, GLASS

Editorial information, Div. II Sec. 10

•Anchor Hocking Glass Corp., Lancaster, Ohio
•Continental Can Co., Hazel-Atlas Glass Div., Wheeling, W. Va.
Corning Glass Works, Corning, N. Y.
Dominion Glass Co., Montreal, Que.
•Erno Products Co., Philadelphia
•Owens-Illinois Glass Co., Toledo, Ohio

TUMBLERS, MOLDED PLASTIC

Editorial information, Div. II Sec. 8

Alladin Plastics, Inc., Gardena, Calif.
Boonton Molding Corp., Boonton, N. J.
•Bradley Associates, Inc., Chicago
Brilhart Plastics Corp., Mineola, N. Y.
Como Plastics, Inc., Columbus, Ind.
Conex Div., Illinois Tool Works, Des Plaines, Ill.
Container Corp. of America, Chicago
•Erno Products Co., Philadelphia
Fedco Corp., Chicago
Ferriot Bros., Inc., Akron, Ohio
Heidi Plastics Corp., Yonkers, N. Y.
Injection Molding Corp., New York
Mutual Plastic Mold Corp., South Gate, Calif.
•Owens-Illinois Glass Co., Toledo, Ohio
Plasticite Corp., Bronx, N. Y.
Plastomatic Corp., Malvern, Pa.
Southern Plastics Co., Columbia, S. C.
Standard Molding Corp., Dayton, Ohio
Superior Plastics, Inc., Chicago
Tech Art Plastics Co., Morristown, N. J.
Tri-State Plastic Molding Co., Henderson, Ky.
Tupper Co., Woonsocket, R. I.
Whyte Mfg. Co., New York

VIALS, GLASS

(See also Ampuls, Glass)

Editorial information, Div. II Sec. 10

•Armstrong Cork Co., Lancaster, Pa.
•Ball Brothers Co., Muncie, Ind.
Braun, W., Co., Chicago
Brockway Glass Co., Brockway, Pa.
Demuth Glass Works, Inc., Parkersburg, W. Va.
•Dougherty Brothers, Buena, N. J.
•Owens-Illinois Glass Co., Toledo, Ohio
•Pennsylvania Glass Products Co., Pittsburgh
Wheaton Glass Co., Millville, N. J.

VIALS, PLASTIC

(Semi-Rigid, Fabricated, Extruded & Molded)

Editorial information, Div. II Sec. 8

Alfa Mfg. Co., Chicago
•Anchor Plastics Co., Long Island City, N. Y.
Apcon Co., Independence, Mo.
•Armstrong Cork Co., Lancaster, Pa.
•Ball Brothers Co., Muncie, Ind.
Boonton Molding Corp., Boonton, N. J.
•Bradley Associates, Inc., Chicago
Braun, W., Co., Chicago
Brilhart Plastics Corp., Mineola, N. Y.
Brockway Glass Co., Brockway, Pa.
•Celluplastics, Inc., Sub. Brockway Glass Co., Newark, N. J.
Continental Plastics of Oklahoma, Oklahoma City, Okla.
Creative Plastic Containers, Culver City, Calif.
Crystal-X Corp., Lenni Mills, Pa.
•Dougherty Brothers, Buena, N. J.
Eclipse Plastic Industries, Inc., Sarasota, Fla.
•Erno Products Co., Philadelphia
•Extruded Plastics, Inc., Norwalk, Conn.
Fabri-Kal Corp., Kalamazoo, Mich.
•Flex Products Corp., Rutherford, N. J.
Frank Plastics Corp., Detroit
Injection Molding Corp., New York
Landsberger Plastics Co., New York
•Lermer Plastics, Inc., Garwood, N. J.
Lone Star Plastics Co., Fort Worth, Texas
Lumelite Corp., Pawling, N. Y.
•Lusteroid Container Co., Maplewood, N. J.
Olympic Plastics Co., Los Angeles
Plastic Assembled Products Co., Baltimore, Md.
Plastic Enterprises, College Point, N. Y.
Plastic Extrusion & Engineering Co., Westboro, Mass.
Plasticite Corp., Bronx, N. Y.
•Plastofilm, Inc., Wheaton, Ill.
Robinson Plastics Corp., New York
Service Engineers, Inc., Fort Worth, Texas
Superior Plastics, Inc., Chicago
Thornton Mfg. Co., Salt Lake City, Utah
Tubophane S.A., Paris, France
Twinpak Ltd., Lachine, Que.
Vacuum Plastics Corp., Columbus, Ohio
Wheaton Plastics Co., Mays Landing, N. J.
Whyte Mfg. Co., New York
Wilson Plastic Container Corp., Brooklyn, N. Y.

DISTRIBUTORS, JOBBERS & SALES AGENTS

(The following sell a variety of Containers in a wide quantity range)

Abana Products, Inc., Chicago
Abest Paper Box Co., New York
Able Container Co., Chicago
Alert Paper Products Co., Brooklyn, N. Y.
Alliance Paper & Packaging Co., New Hyde Park, N. Y.
Allied Commodities Co., Minneapolis
Allpak Co., Chicago
American Carton Wrapper Co., Chicago
American Cordage & Paper Corp., New York
Anderson, R. P., Co., Dallas, Texas
Ansell, S. H., & Son, Inc., Boston
Basic Material Supply Co., New York
Bel-Art Products, Pequannock, N. J.
Berk, O., Co., Newark, N. J.
Blake, Moffitt & Towne, San Francisco
Bonder Glass & Closure Co., Brooklyn, N. Y.
Bosworth & Co., Cincinnati
Bracamonte, R. M., & Co., San Francisco
Bradner Smith & Co., Chicago
Bristol Paper Products, Inc., Long Island City, N. Y.
Busse, Robert, & Co., New York
COSECO, Los Angeles
Carney & McReynolds, Chicago
Chelsea Bottle Co., Chelsea, Mass.
Chicago Paper Co., Chicago
Chicago Wood & Plastic Products, Chicago
Cincinnati Container Co., Cincinnati
Colburn, Harold E., Rochester, N. Y.
Container Service Co., Los Angeles
Crystal Preforming & Packaging, Inc., Warsaw, Ind.
Crystal-X Corp., Lenni Mills, Pa.
Dreyer, H. D., Box Co., Baltimore, Md.
Emmer Glass Corp., Miami, Fla.
Evans Crowder Co., So. Lyon, Mich.
Faran Co., New York
Feldman Glass Co., New Haven, Conn.
Fleetwood Paper Co., Chicago
Fleischer Paper Co., Chicago
Flyndustries, Inc., New York
Gates, N. T., Co., Pennsauken, N. J.
Ginsburg Bros., Inc., Somerville, Mass.
Gould, Stephen, Paper Co., Bayonne, N. J.
Hartung, A., & Co., Philadelphia
House of More, San Francisco
Hurwich, R., Co., Berkeley, Calif.
Industrial Plastic Supply Div., Industrial Safety Supply Co., W. Hartford, Conn.
Inland Paper Products Corp., New York
International Graphics, Inc., Chicago
Ison Co., Atlanta, Ga.
Jack, Vern, & Assoc., Willoughby, Ohio
Inlander Steindler Paper Co., Chicago
Kalamazoo Paper Box Corp., Kalamazoo, Mich.
Levine, Theodore R., & Sons, Paterson, N. J.
Lyle, Edgar, Packaging Co., Hamden, Conn.
Marks, Edward M., Co., Los Angeles
McMackin, Hugh J., Co., Boston
Mendola Bros., Inc., New Orleans, La.
Millar, George W., & Co., New York
Miller-Lenfesty Supply Co., Tampa, Fla.
Minnesota Filler Co., Minneapolis
Monroe-Danford & Co., Weehawken, N. J.
Murnane Paper Co., Northlake, Ill.
Muskegon Marking Equipment Co., Packaging Supplies Div., Muskegon, Mich.
Nash-Hammond, Inc., El Monte, Calif.
Nebel Paper Products Co., Charlotte, N. C.
New York Label & Box Corp., New York
Nolan, James H., Associates, Chicago
Oakland Paper Box Co., Emeryville, Calif.
Odman, Irving L., Co., Chicago
Packageers Co., Chicago
Packaging Pioneers, Inc., Tuckahoe, N. Y.
Packaging Products & Design Corp., Newark, N. J.
Palmer Supplies Co., Miami Springs, Fla.
Peavey, Lynn, Co., Overland Park, Kan.
Pein Box & Lumber Co., Portland, Ore.
Penn Bottle & Supply Co., Philadelphia
Ponten, Jean S., Co., Oakland, Calif.
Poris, Harry, Co., New York
Posner, S., Sons, Inc., Brooklyn, N. Y.
Premier Packages, Inc., St. Louis, Mo.
Presque Isle Paper Products, Erie, Pa.
Quimby-Walstrom Paper Co., Grand Rapids, Mich.
Rabinowitz, J., & Sons, Brooklyn, N. Y.
Resnick, L., & Sons, Philadelphia
Richmond Paper Co., Highland, Calif.
Riekes Equipment Co., Omaha, Neb.
Robertson Co., Jamaica, N. Y.
Rodgers Packaging, New York
Rodney, Jim, Co., Detroit
Rosedale, T., New York
Sager Bros., New York
Salwen, Joe, Paper Products Corp., Brooklyn, N. Y.
Servon, Inc., New York
Shadur Box Co., Milwaukee
Sonorol Laboratories, New York
Spec-Fab Co., Riverton, N. J.
Spring Supply, Inc., Portland, Ore.
Sternberger, Milton, Co., Memphis, Tenn.
Successful Products, Inc., Brooklyn, N. Y.
Timely Packaging Associates, New York
Treen Box Co., Philadelphia
Twinpak Ltd., Lachine, Que.
Union Transbag Co., Providence, R. I.
Vickers, Charles D., & Co., La Grange, Ill.
Visible Package Sales Corp., Chicago
Vizuall Co., New York
Ward & Douglass, Chatham, N. J.
Wilson, J. W., Glass Co., Brooklyn, N. Y.
Workman-Powell, Inc., Freeport, N. Y.
Zellerbach Paper Co., San Francisco

Machinery and Equipment

AUXILIARY DEVICES & ATTACHMENTS

A. *Clutch-Brakes*
B. *Counting Devices*
C. *Dehumidifiers*
D. *Dryers*
E. *Glue Guns*
F. *Heating Units*
G. *Hole Punching Equipment*
H. *Humidifying Equipment*
I. *Humidity Controls*
J. *Humidity Indicators*
K. *Machine Knives*
L. *Registration Controls*
M. *Sheet Cleaners*
N. *Sprayers*
O. *Static Eliminators*
P. *Thermostats*
Q. *Web Controls*
R. *Web Inspection Controls*
S. *Web Splicers*

Editorial information, Div. III Sec. 13

Abbeon, Inc., Jamaica, N. Y. (C, H, I, J)
•Ackerman Gould Co., Oceanside, N. Y. (F, P)
Advance Process Supply Co., Chicago (D)
Aeroil Products Co., So. Hackensack, N.J. (F)
•American Can Co., Canco Div., New York (D)
Anderson-Bolds, Inc., Cleveland (F, L, P)
•Appleton Machine Co., Appleton, Wis. (A)
Armstrong Machine Works, Three Rivers, Mich. (H, I)
Atlas Silk Screen Supply Co., Chicago (O)
Autotron, Inc., Danville, Ill. (B, L, Q, R)
Bahnson Co., Winston-Salem, N. C. (H, I)
Belilove Co., San Francisco (F, P)
Bethlehem Steel Co., Bethlehem, Pa. (D)
Bristol Co., Waterbury, Conn. (B, I, J)
Butler Automatic Machine, Inc., Cambridge, Mass. (S)
Cambridge Instrument Co., New York (J)
Carse Electric Corp., Albany, N. Y. (B, F, L, O, P)
Cerutti Presses of America, Inc., Westfield, N. J. (R, S)
Chase Equipment Co., Div. C. W. Logeman Co., Brooklyn, N. Y. (N)
Coes Knife Co., Worcester, Mass. (K)
•Colton, Arthur, Co., Detroit (B, D)
•Conapac Corp., New York (G)
Cutler-Hammer, Inc., Milwaukee (A, Q)
Dawson, F. C., Engineering Co., Canton, Mass. (D, F)
Delta Engineering Corp., Melrose, Mass. (B, L)
DeVilbiss Co., Toledo, Ohio (N)
Diverse Products, Brooklyn, N. Y. (B)
Doyle, J. E., Co., Cleveland (D, M, O)
Drum Equipment Corp., Union, N. J. (D, N)
Dryomatic Corp., Alexandria, Va. (C, I, J)
Durant Mfg. Co., Milwaukee (B)
•Dusenbery, John, Co., Clifton, N. J. (K, L, Q)
Electric Hotpack Co., Philadelphia (C, D, F, H)
Electronic Machine Parts, Inc., College Point, N. Y. (L)
Electronic Processes Corp., San Francisco (P)
Electronics Corp. of America, Photoswitch Div., Cambridge, Mass. (B, L, R)
Engelman, H. C., Co., Roseville, Mich. (F, P)
Exactron, Inc., Dumont, N. J. (L)
Faustel, Inc., Butler, Wis. (D, G)
Fenwal, Inc., Ashland, Mass. (P)
Fife Mfg. Co., Oklahoma City, Okla. (L, Q)
Fox, John P., Co., Monrovia, Calif. (E)
GPE Controls, Inc., Chicago (Q, R)
General Electric Co., Apparatus Sales Div., Schenectady, N. Y. (F, L, O, P)
General Electric Co., Specialty Control Dept., Waynesboro, Va. (B, Q, R)
Gluetools, Inc., Indianapolis (E)
Gray Co., Minneapolis (E)
H & W Machinery Corp., Richmond Hill, N. Y. (K)
Heat Sealing Equipment Mfg. Co., Cleveland (G)
Helix Machine Co., Hicksville, N. Y.
•Herbert Products, Inc., Westbury, N. Y. (D, F, M, O, P)
•Hobbs Mfg. Co., Worcester, Mass. (A, Q)
Humidial Co., Colton, Calif. (J)
International Eastern Co., New York (B, G)
Johnstone Engineering & Machine Co., Parkesburg, Pa. (B, K, L, Q)
Kabar Mfg. Corp., Roosevelt, N. Y. (F)
Ketchpel Engineering Co., W. Englewood, N. J. (G, K)
•Lakso Co., Fitchburg, Mass. (B)
•Lawson Co., Div. Miehle-Goss-Dexter, Inc., Chicago (G)
Lustra-Cite Industries, Inc., Brooklyn, N. Y. (O)
Machine-O-Matic, Inc., Evanston, Ill. (L, Q)
Machinery Electrification, Inc., Northboro, Mass. (L, Q)
•Main, Robert A., & Sons, Inc., Wyckoff, N. J. (G)
Maxson Automatic Machinery Co., Westerly, R. I. (B, O)
Mayflower Electronic Devices, Inc., Little Ferry, N. J. (Q)
McDougall Control Co., Seattle, Wash. (C, D, F, H, I, J, P)
Minneapolis-Honeywell Regulator Co., Minneapolis (H, I, J, P)
Miskella Infra-Red Co., Cleveland (D, F)
Molins Machine Co., Richmond, Va. (K)
Moore, Kenneth J., & Co., Chicago (E, F)
•National Equipment Corp., New York (F)
National Laboratories & Mfg. Corp., Midland Park, N. J. (R)
North American Mfg. Co., Cleveland (L, Q, R)
•Ogden Mfg. Co., Chicago (F, P)
Ohio Knife Co., Cincinnati (K)
Ortman-McCain Co., Chicago (E, H, N)
Oxy-Dry Sprayer Corp., Chicago (D, M, N, O)
Package Forming Machinery Co., Toronto, Ont. (F)
Paco Winders, Inc., Philadelphia (G)
Paper Machinery Corp., Milwaukee (B, D)
Patron Transmission Co., New York (A)
Peco Corp., Mountain View, Calif. (B)
Perkins, B. F., & Son, Inc., Holyoke, Mass. (B, Q)
•Perry Industries, Inc., Brooklyn, N. Y. (C)
Photobell Co., New York (B, L, R)
Photomation, Inc., Mountain View, Calif. (B, L, Q)
Pneuma-Flo Systems, Inc., New York (D, F, H, N, O)
Pratt Mfg. Corp., Milwaukee (G)
Presin Co., Santa Monica, Calif. (B, L, R)
Pyrometer Service Co., No. Arlington, N. J. (P)
Randall Duster Corp., Briarcliff Manor, N. Y. (N)
Rapids-Standard Co., Grand Rapids, Mich. (B)
Renka Bagmachines Establishment, Amsterdam, Holland (O, Q)
Rockport Machine & Tool Co., Cleveland (G, K)
Royle, John, & Sons, Paterson, N. J. (F)
Sensory, Inc., Morristown, N. J. (B)
Shaw, Frank, Co., Los Angeles (B)
•Simco Co., Lansdale, Pa. (O)
Smith & Winchester Mfg. Co., So. Windham, Conn. (K, O)
Southwestern Controls, Inc., Houston, Texas (B, F, L, P, Q)
Standard Instrument Corp., New York (B, L, Q)
Stanford Engineering Co., Salem, Ill. (A, Q, R, S)
Sta-Warm Electric Co., Ravenna, Ohio (F)
Sterling, Inc., Milwaukee (F)
Taylor, Stiles & Co., Riegelsville, N. J. (K)
Thermatron Co., Div. Willcox & Gibbs, New York (D, F)
Thermel, Inc., Franklin Park, Ill. (F)
•Thermo Heat-Sealing Machine Co., New York (F)
Thermomat Co., Trenton, N. J. (D, F)
•Tol-O-Matic, Inc., Minneapolis (A)
•United Shoe Machinery Corp., Boston (E)
Veeder-Root, Inc., Hartford, Conn. (B)
•Vulcan Electric Co., Danvers, Mass. (F, P)
•Waldron-Hartig Div., Midland-Ross Corp., New Brunswick, N. J. (D, Q, S)
Walton Laboratories, Inc., Irvington, N. J. (H, I, J)
Warner Electric Brake & Clutch Co., Beloit, Wis. (A)
Watlow Electric Mfg. Co., St. Louis, Mo. (F)
•Web Controls Corp., W. Englewood, N. J. (A, L, R, S)
Weber, H. G., & Co., Kiel, Wis. (G, L, Q)
Weber Marking Systems, Inc., Mt. Prospect, Ill. (B)
Wellington Associates, Phoenixville, Pa. (B, F)
West Instrument Corp., Chicago (P)
Wiegand, Edwin L., Co., Pittsburgh (F)
Zack Radiant Heat Co., Passaic, N. J. (F)

CHAINS, ROLLER

Chain Belt Co., Milwaukee
•Diamond Chain Co., Indianapolis
Dodge Mfg. Corp., Mishawaka, Ind.
Hewitt-Robins, Inc., Stamford, Conn.
Jeffrey Mfg. Co., Columbus, Ohio
Lathrop Paulson Co., Chicago
Link-Belt Co., Chicago
Patron Transmission Co., New York
Sage Equipment Co., Buffalo, N. Y.
U. S. Bottlers Machinery Co., Chicago

CONVEYORS

A. *Gravity*
B. *Portable*
C. *Power Driven*

Editorial information, Div. III Sec. 12

Acme Pallet Co., New York (A, B, C)
Alvey Conveyor Mfg. Co., St. Louis, Mo. (A, B, C)

Alvey-Ferguson Co., Cincinnati (A, B, C)
•American Can Co., Canco Div., New York (A, B, C)
•Amsco Packaging Machinery, Inc., Long Island City, N. Y. (C)
Automation Devices, Inc., Erie, Pa. (C)
Automation Engineering Laboratories, Inc., Stamford, Conn. (C)
Autopack Ltd., Malvern Link, Worcestershire, England (C)
Barry-Wehmiller Machinery Co., St. Louis, Mo. (A, C)
Bemis Bro. Bag Co., St. Louis, Mo. (C)
Bonded Scale & Machine Co., Columbus, Ohio (B, C)
Brady Conveyors Corp., Skokie, Ill. (B, C)
Buschman, E. W., Co., Cincinnati (A, B, C)
Cayne, Albert H., Equipment Corp., New York (A, B, C)
•Chisholm-Ryder Co. of Pa., Hanover, Pa. (C)
Circle Design & Mfg. Corp., Emerson, N. J. (C)
•Colton, Arthur, Co., Detroit (C)
Conveyor Systems, Inc., Morton Grove, Ill. (A, B, C)
Dairy Whipt Div., Aerated Container Corp., Chicago (C)
•Doughboy Industries, Inc., New Richmond, Wis. (B, C)
Dravo Corp., Pittsburgh (C)
•Economic Machinery Co., Worcester, Mass. (C)
Exactron, Inc., Dumont, N. J. (C)
•FMC Corp., Canning Machinery Div., San Jose, Calif. (A, B, C)
FMC Corp., Packing Equipment Div., Riverside, Calif. (A, B, C)
Ferguson, Harry J., Co., Jenkintown, Pa. (A, B, C)
Flexoveyor Mfg. Co., Denver, Colo. (B, C)
•Foils Packaging Corp., Cincinnati (C)
•Frazier & Son, Clifton, N. J. (C)
•Fry, George H., Co., Mineola, N. Y. (C)
Gisholt Machine Co., Madison, Wis. (A, C)
Great Lakes Runway & Engineering Co., Chicago (A, B, C)
Great Lakes Stamp & Mfg. Co., Chicago (A, B, C)
Griswold Engineering Ltd., Montreal, Que. (C)
•Herbert Products, Inc., Westbury, N. Y. (B, C)
Hewitt-Robins, Inc., Stamford, Conn. (C)
Hooper, J. R., Co., Brookfield, Ill. (A, B, C)
•Horix Mfg. Co., Pittsburgh (A, B, C)
Ideal Packagings Ltd., London, England (C)
Industrial Conveyor Co., Chicago (A, B, C)
International Conveyor & Washer Corp., Detroit (B, C)
Island Equipment Corp., Hialeah, Fla. (A, B, C)
Jeffrey Mfg. Co., Columbus, Ohio (C)
Johns-Nigrelli-Johns, Skokie, Ill. (A, B, C)
•Karstrom Co., Menomonee Falls, Wis. (C)
•Lakso Co., Fitchburg, Mass. (C)
Lamson Corp., Syracuse, N. Y. (A, B, C)
Lathrop Paulson Co., Chicago (A, B)
Liberty Engineering Co., Beloit, Wis. (A, C)
Link-Belt Co., Chicago (C)
Logan Co., Louisville, Ky. (A, B, C)
•Lynch Corp., Anderson, Ind. (B, C)
M-H Standard Corp., Jersey City, N. J. (B, C)
Mathews Conveyor Co., Ellwood City, Pa. (A, B, C)
Mechanical Handling Systems, Inc., Detroit (A, B, C)
•Mercury Heat Sealing Equipment Co., Philadelphia (B, C)
Metzgar Conveyor Co., Grand Rapids, Mich. (A, B, C)
Meyer, Geo. J., Mfg. Co., Cudahy, Wis. (C)
New London Engineering Co., New London, Wis. (B, C)
Olson, Samuel, Mfg. Co., Chicago (A, B, C)
Patron Transmission Co., New York (A, B, C)
Peco Corp., Mountain View, Calif. (A, C)
•Perry Industries, Inc., Brooklyn, N. Y. (C)
Pettibone Mulliken Corp., Chicago (B)
Power Curve Conveyor Co., Denver, Colo. (B, C)
Rapids-Standard Co., Grand Rapids, Mich. (A, B, C)
Rebo Mfg. Co., Newark, N. J. (A, B, C)
Roberts Patent Filling Machine Co., Bolton, Lancs., England (A, B, C)
Rockford Package & Container Corp., Rockford, Ill. (C)
Sage Equipment Co., Buffalo, N. Y. (A, B, C)
•Sanford, William B., Inc., New York (A, B, C)
Sealaround Corp., Chicago (A, C)
Speedways Conveyors, Inc., Buffalo, N. Y. (A, B, C)
Standard Conveyor Co., No. St. Paul, Minn. (A, B, C)
Standard Paper Box Machine Co., New York (C)
Stuyvesant Engineering Corp., Norwood, N. J. (C)
Thiele Packaging Machinery Co., Div. Stainless & Steel Products Co., St. Paul, Minn. (C)
•Tol-O-Matic, Inc., Minneapolis (C)
•Trescott Co., Fairport, N. Y. (C)
Tri Pak Machinery Service, Inc., Harlingen, Texas (A, B, C)
Union Bag-Camp Paper Corp., New York (C)
Union Steel Products Co., Albion, Mich. (B, C)
U. S. Bottlers Machinery Co., Chicago (A, B, C)
Weigh Right Automatic Scale Co., Joliet, Ill. (C)
Wellington Associates, Phoenixville, Pa. (C)
Western Gear Corp., Lynwood, Calif. (C)

DETECTORS

(Fill, Metal, Etc.)

Editorial information, Div. III Sec. 13

Allis-Chalmers Mfg. Co., Milwaukee
Automation Devices, Inc., Erie, Pa.
Barry-Wehmiller Machinery Co., St. Louis, Mo.
Dice, J. W., Co., Englewood, N. J.
Engelhard Industries, Inc., Newark, N. J.
•Foils Packaging Corp., Cincinnati
General Electric Co., Apparatus Sales Div., Schenectady, N. Y.
Industrial Nucleonics Corp., Columbus, Ohio
Machine-O-Matic, Inc., Evanston, Ill.
Machinery Electrification, Inc., Northboro, Mass.
Meyer, Geo. J., Mfg. Co., Cudahy, Wis.
Peco Corp., Mountain View, Calif.
Photomation, Inc., Mountain View, Calif.
Presin Co., Santa Monica, Calif.
Standard Instrument Corp., New York

DEVICES, CUTTING, PERFORATING, SCORING

Editorial information, Div. III Sec. 14

Abana Products, Inc., Chicago
Aidlin Automation, Inc., Brooklyn, N. Y.
Automation Engineering Laboratories, Inc., Stamford, Conn.
Faustel, Inc., Butler, Wis.
•Foils Packaging Corp., Cincinnati
Globe Mfg. Co., Philadelphia
Helix Machine Co., Hicksville, N. Y.
•Hobbs Mfg. Co., Worcester, Mass.
•Industrial Marking Equipment Co., Brooklyn, N. Y.
Ketchpel Engineering Co., W. Englewood, N. J.
•Lynch Corp., Anderson, Ind.
•Main, Robert A., & Sons, Inc., Wyckoff, N. J.
•Manhasset Machine Co., Amityville, N. Y.
Paper Converting Machine Co., Green Bay, Wis.
Pratt Mfg. Corp., Milwaukee
Rockport Machine & Tool Co., Cleveland
•Tronomatic Corp., Bronx, N. Y.

DIES

A. Blister Forming, Trimming
B. Cutting
C. Electronic/Heat-Sealing

Editorial information, Div. III Sec. 14, Div. IV Sec. 15

Accurate Steel Rule Die Manufacturers, New York (B)
Independent Die & Supply Co., St. Louis, Mo. (A, B, C)
New Era Die Co., Red Lion, Pa. (A, B, C)
Rockport Machine & Tool Co., Cleveland (B)
Standard Paper Box Machine Co., New York (B)
•Tronomatic Corp., Bronx, N. Y. (B)

EQUIPMENT, AIR PUMPS

(For Suction & Pressure)

Editorial information, Div. III Sec. 13

Allis-Chalmers Mfg. Co., Milwaukee
DeVilbiss Co., Toledo, Ohio
•Foils Packaging Corp., Cincinnati
Graymills Corp., Chicago
Leiman Bros., Inc., Newark, N. J.
•M-D Blowers, Inc., Sub. Miehle-Goss-Dexter, Inc., Racine, Wis.
•Perry Industries, Inc., Brooklyn, N. Y.
Rapids-Standard Co., Grand Rapids, Mich.

EQUIPMENT, COLOR MATCHING

Editorial information, Div. IV Sec. 15

California Ink Co., San Francisco
Crown Engineering & Sales Co., Harrison, N. J.
General Electric Co., Apparatus Sales Div., Schenectady, N. Y.
Instrument Development Laboratories, Inc., Attleboro, Mass.
Manufacturers Engineering & Equipment Corp., Hatboro, Pa.

EQUIPMENT, FILM SHRINKING

(Shrink Tunnels, Heat Guns, Etc.)

Editorial information, Div. III Sec. 12

•Clamco Div., Cleveland-Detroit Corp., Cleveland
•FMC Corp., Hudson-Sharp Plant, Green Bay, Wis.
•Formatron, Inc., Philadelphia
Grace, W. R., & Co., Cryovac Div., Cambridge, Mass.
Great Lakes Stamp & Mfg. Co., Chicago

Heat Sealing Equipment Mfg. Co., Cleveland
Hollywood Industries, Inglewood, Calif.
Master Appliance Corp., Racine, Wis.
•Mehl Mfg. Co., Cincinnati
Packageers Co., Chicago
Sealaround Corp., Chicago
•Trescott Co., Fairport, N. Y.
•Weldotron Corp., Newark, N. J.

EQUIPMENT, FOAM MOLDING

•Champlain-Zapata Plastics Machinery Co., Caldwell, N. J.
Expandex Corp., Wauregan, Conn.
Miller & Van Winkle Co., Polystyrene Machinery Div., Paterson, N. J.
Springfield Cast Products, Worcester, Mass.
•Tronomatic Corp., Bronx, N. Y.

EQUIPMENT, MATERIALS HANDLING

Editorial information, Div. III Sec. 12

Alvey Conveyor Mfg. Co., St. Louis, Mo.
Alvey-Ferguson Co., Cincinnati
•American Can Co., Canco Div., New York
•Amsco Packaging Machinery, Inc., Long Island City, N. Y.
Andora Automation, Inc., Brooklyn, N. Y.
Automation Devices, Inc., Erie, Pa.
Automation Engineering Laboratory, Inc., Stamford, Conn.
Automation Management, Inc., Westboro, Mass.
Baker Industrial Trucks, Div. Otis Elevator Co., Cleveland
Barrett-Cravens Co., Northbrook, Ill.
Bin-Dicator Co., Detroit
Bonded Scale & Machine Co., Columbus, Ohio
Buschman, E. W., Co., Cincinnati
Cayne, Albert H., Equipment Corp., New York
Chain Belt Co., Milwaukee
Circle Design & Mfg. Corp., Emerson, N. J.
Clark Equipment Co., Industrial Truck Div., Battle Creek, Mich.
•Clark-Aiken Co., Lee, Mass.
Conveyor Systems, Inc., Morton Grove, Ill.
Cooper, D. C., Co., Chicago
Crowe Engineering Co., Cincinnati
Dravo Corp., Pittsburgh
Drum Equipment Corp., Union, N. J.
East Chicago Machine Tool Corp., East Chicago, Ind.
Elwell-Parker Electric Co., Cleveland
Eriez Mfg. Co., Erie, Pa.
Excelsior Plimptruck Co., Stamford, Conn.
Factory Service Co., Milwaukee
Fairbanks Co., New York
Flexoveyor Mfg. Co., Denver, Colo.
•Frazier & Son, Clifton, N. J.
General Electric Co., Apparatus Sales Div., Schenectady, N. Y.
General Electric Co., Specialty Control Dept., Waynesboro, Va.
Gray Co., Minneapolis
•Gump, B. F., Co., Chicago
Hamilton Caster & Mfg. Co., Hamilton, Ohio
Hamilton Tool Co., Hamilton, Ohio
Hi-Speed Checkweigher Co., Ithaca, N. Y.
Hooper, J. R., Co., Brookfield, Ill.
Impact-O-Graph Corp., Cleveland
Industrial Conveyor Co., Chicago
International Conveyor & Washer Corp., Detroit
Island Equipment Corp., Hialeah, Fla.
Jeffrey Mfg. Co., Columbus, Ohio
Lathrop Paulson Co., Chicago
Lewis-Shepard Products, Inc., Watertown, Mass.
Lift Trucks, Inc., Cincinnati
Link-Belt Co., Chicago
Logan Co., Louisville, Ky.
Louden Machinery Co., Fairfield, Iowa
•Lynch Corp., Anderson, Ind.
M-H Standard Corp., Jersey City, N. J.
Mechanical Handling Systems, Inc., Detroit
Metzgar Conveyor Co., Grand Rapids, Mich.
Motec Industries, Inc., Hopkins, Minn.
Paltier Corp., Michigan City, Ind.
Peco Corp., Mountain View, Calif.
•Perry Industries, Inc., Brooklyn, N. Y.
Pettibone Mulliken Corp., Chicago
Pollard Bros. Mfg. Co., Chicago
Rebo Mfg. Co., Newark, N. J.
Revolvator Co., No. Bergen, N. J.
Sage Equipment Co., Buffalo, N. Y.
Smith & Winchester Mfg. Co., So. Windham, Conn.
Standard Conveyor Co., No. St. Paul, Minn.
Thomas Truck & Caster Co., Keokuk, Iowa
Tier-Rack Corp., St. Louis, Mo.
Tri Pak Machinery Service, Inc., Harlingen, Texas
Union Bag-Camp Paper Corp., New York
Wellington Associates, Phoenixville, Pa.
West Bend Equipment Corp., West Bend, Wis.
•Wrap-King Div., Crompton & Knowles Packaging Corp., Agawam, Mass.

EQUIPMENT, STERILIZING

(For Packaged Products)

Editorial information, Div. III Sec. 12

American Sterilizer Co., Erie, Pa.
Ampoule Machine Co., Long Island City, N. Y.
Barry-Wehmiller Machinery Co., St. Louis, Mo.
Electric Hotpack Co., Philadelphia
Engelhard Industries, Inc., Newark, N. J.
FMC Corp., Packing Equipment Div., Riverside, Calif.
•Foils Packaging Corp., Cincinnati

HAMMERS & TACKERS, AUTOMATIC FEED

Editorial information, Div. III Sec. 13

•Bostitch, Inc., E. Greenwich, R. I.
•United Shoe Machinery Corp., Boston

HEAT SEALERS

A. Hand Irons
B. Hot Plates

Editorial information, Div. III Sec. 12

American Paper Box Co., Montreal, Que. (B)
•Amsco Packaging Machinery, Inc., Long Island City, N. Y. (A, B)
Bag-O-Matic Packaging Equipment Co., Los Angeles (A, B)
Casting Masters, Inc., Appliance Div., Chicago (A, B)
Central States Paper & Bag Co., St. Louis, Mo. (A, B)
•Clamco Div., Cleveland-Detroit Corp., Cleveland (A, B)
Cooper, D. C., Co., Chicago (A)
Dove, J. B., & Sons, Inc., Bristol, Pa. (A, B)
Dura-Lee Corp., Kansas City, Kan. (A, B)
Era Research, Santa Monica, Calif. (A)
•Errich International Corp., New York (A, B)
France Engineering Co., Cleveland (A, B)
General Machinery Corp., Sheboygan, Wis. (B)
Grace, W. R., & Co., Cryovac Div., Cambridge, Mass. (A, B)
Great Lakes Stamp & Mfg. Co., Chicago (A, B)
Heat Sealing Equipment Mfg. Co., Cleveland (A, B)
•Karstrom Co., Menomonee Falls, Wis. (A, B)
McDougall Control Co., Seattle, Wash. (A, B)
Miller Wrapping & Sealing Machine Co., Chicago (A, B)
•Northland Bag Corp., Yonkers, N. Y. (A)
•Oliver Machinery Co., Grand Rapids, Mich. (B)
Packaging Laboratories & Designing Ltd., Montreal, Que. (A, B)
•Pack-Rite Machines, Div. Techtmann Industries, Inc., Milwaukee (A, B)
•Queen Transparent Specialties Co., Chicago (A, B)
Roll-O-Sheets, Inc., St. Louis, Mo. (B)
Thermatron Co., Div. Willcox & Gibbs, New York (B)
Thermel, Inc., Franklin Park, Ill. (B)
•Thermo Heat-Sealing Machine Co., New York (B)
•Vertrod Corp., Brooklyn, N. Y. (A)
•Vulcan Electric Co., Danvers, Mass. (A, B)
Watlow Electric Mfg. Co., St. Louis, Mo. (A, B)
Wells Commercial Sales Co., So. San Francisco, Calif. (A, B)
Wiegand, Edwin L., Co., Pittsburgh (B)

HEAT SEALERS

(For Blister-Pack Cards)

Editorial information, Div. II Sec. 8, Div. III Sec. 12, 14

Abbott Eastern Machinery Sales Corp., New York
•Abbott Plastic Machine Corp., Chicago
American Paper Box Co., Montreal, Que.
American Thermoform Corp., Culver City, Calif.
•Atlas Vac-Machine Corp., Rochester, N. Y.
Bag-O-Matic Packaging Equipment Co., Los Angeles
Callanan, J. A., Co., Chicago
•Diederichs & Griffin Co., Chicago
Era Research, Inc., Santa Monica, Calif.
•Erdco Engineering Corp., Addison, Ill.
•Globe Industries, Inc., Philadelphia
Habgood, Warren J., Co., Millbourne, Pa.
Kabar Mfg. Corp., Roosevelt, N. Y.
Kalle A.G., Wiesbaden, Germany
Mahaffy Engineering Co., Little Falls, N. J.
Mankato Paper Box Co., Mankato, Minn.
•National Equipment Corp., New York
Nevins Co., Clifton, N. J.
•Northland Bag Corp., Yonkers, N. Y.
•Packaging Industries Ltd., Montclair, N. J.
Pan-O-Ramic Package Co., Janesville, Wis.
Robins Engineering Co., No. Haven, Conn.
•Sealomatic Electronics Corp., New York
Shaw, Frank, Co., Los Angeles
•Sundstrand-American Broach Div., Sundstrand Corp., Ann Arbor, Mich.
Thermatron Co., Div. Willcox & Gibbs, New York
•Thermo Heat-Sealing Machine Co., New York
•Tronomatic Corp., Bronx, N. Y.
•Weldotron Corp., Newark, N. J.
•Wirth Rhodes Corp., Chicago

HEAT SEALERS, AUTOMATIC

(See Machines, Heat Sealing, Complete & Separate Units)

LABELERS

(See Machines, Labeling; also Machines, Label Dispensing)

MACHINES, AEROSOL CRIMPING

Editorial information, Div. II Sec. 11

•Aerosol Machinery Co., Westbury, N. Y.
Andora Automation, Inc., Brooklyn, N. Y.
Autopack Ltd., Malvern Link, Worcestershire, England
Builders Sheet Metal Works, Inc., New York
•Consolidated Packaging Machinery Corp., Buffalo, N. Y.
Cozzoli Machine Co., Plainfield, N. J.
Dairy Whipt Div., Aerated Container Corp., Chicago
•Kartridg Pak Co., Mount Prospect, Ill.
Nalbach, John R., Engineering Co., Chicago
•PMC Industries, Hackensack, N. J.
•Pressure Pak, Inc., W. Palm Beach, Fla.
Robins Engineering Co., No. Haven, Conn.

MACHINES, AEROSOL LOADING & FILLING

Editorial information, Div. II Sec. 11

•Aerosol Machinery Co., Westbury, N. Y.
Andora Automation, Inc., Brooklyn, N. Y.
Autopack Ltd., Malvern Link, Worcestershire, England
Builders Sheet Metal Works, Inc., New York
Burt, F. L., Co., San Francisco
•Colton, Arthur, Co., Detroit
Dairy Whipt Div., Aerated Container Corp., Chicago
Elgin Mfg. Co., Elgin, Ill.
•Horix Mfg. Co., Pittsburgh
•Kartridg Pak Co., Mount Prospect, Ill.
Kiefer, Karl, Machine Co., Cincinnati
Modern Packaging Machinery Co., Van Nuys, Calif.
Nalbach, John R., Engineering Co., Chicago
•National Instrument Co., Baltimore, Md.
•Perry Industries, Inc., Brooklyn, N. Y.
Pfaudler Co., Div. Pfaudler Permutit, Inc., Rochester, N. Y.
•Pressure Pak, Inc., W. Palm Beach, Fla.
Robins Engineering Co., No. Haven, Conn.
Saga Packaging Machinery Div., A & M Tool & Die Co., Southbridge, Mass.
•Sanford, William B., Inc., New York

MACHINES, AEROSOL TESTING

Editorial information, Div. II Sec. 11

•Aerosol Machinery Co., Westbury, N. Y.
Andora Automation, Inc., Brooklyn, N. Y.
Builders Sheet Metal Works, Inc., New York
Dairy Whipt Div., Aerated Container Corp., Chicago
Island Equipment Corp., Hialeah, Fla.
•Kartridg Pak Co., Mount Prospect, Ill.
•Pressure Pak, Inc., W. Palm Beach, Fla.
Robins Engineering Co., No. Haven, Conn.
Wellington Associates, Phoenixville, Pa.

MACHINES, AMPUL FILLING & SEALING

Editorial information, Div. III Sec. 12

Ampoule Machine Co., Long Island City, N. Y.
•Arenco Machine Co., New York
Autopack Ltd., Malvern Link, Worcestershire, England
Chase Equipment Co., Div. C. W. Logeman Co., Brooklyn, N. Y.
Cozzoli Machine Co., Plainfield, N. J.
Filpaco Industries, Inc., Chicago
International Eastern Co., New York
Kahlenberg-Globe Equipment Co., Sarasota, Fla.
•National Equipment Corp., New York
•National Instrument Co., Baltimore, Md.
•Perry Industries, Inc., Brooklyn, N. Y.
U. S. Bottlers Machinery Co., Chicago
Wellington Associates, Phoenixville, Pa.

MACHINES, AMPUL PRINTING

Editorial information, Div. III Sec. 13

•Amaco, Inc., Chicago
•Apex Machine Co., College Point, N. Y.
•Bell-Mark Corp., Bloomfield, N. J.
•Industrial Marking Equipment Co., Brooklyn, N. Y.
International Eastern Co., New York
•Markem Machine Co., Keene, N. H.
Newman Labelling Machines Ltd., Barnet, Herts., England
Pan Industrial Corp., New York
•Rondo of America, Hamden, Conn.

MACHINES, AMPUL WASHING

Editorial information, Div. III Sec. 12

•Amaco, Inc., Chicago
Ampoule Machine Co., Long Island City, N. Y.
•Arenco Machine Co., New York
Autopack Ltd., Malvern Link, Worcestershire, England
Cozzoli Machine Co., Plainfield, N. J.
Eyrle Co., San Francisco
•Perry Industries, Inc., Brooklyn, N. Y.
U. S. Bottlers Machinery Co., Chicago

MACHINES, BAG OR ENVELOPE CLOSING & SEALING

Editorial information, Div. III Sec. 12

•Amaco, Inc., Chicago
American Thermoform Corp., Culver City, Calif.
•Amsco Packaging Machinery, Inc., Long Island City, N. Y.
•Arenco Machine Co., New York
Autopack Ltd., Malvern Link, Worcestershire, England
Bag-O-Matic Packaging Equipment Co., Los Angeles
Barraclough, R. W., Ltd., Southport, Lancashire, England
Bemis Bro. Bag Co., St. Louis, Mo.
•Brown Filling Machine Co., Sub. Sundstrand Corp., Ann Arbor, Mich.
•Carbert Mfg. Co., Div. Pneumatic Scale Corp., Quincy, Mass.
•Consolidated Packaging Machinery Corp., Buffalo, N. Y.
•Continental Can Co., Flexible Packaging Div., Mt. Vernon, Ohio
Derby Sealers Div., Minnesota Mining & Mfg. Co., Derby, Conn.
E-Z Packaging Corp., Chicago
•Errich International Corp., New York
•FMC Corp., Simplex Plant, Oakland, Calif.
•Fry, George H., Co., Mineola, N. Y.
Geveke & Co., Elmsford, N. Y.
Glendale Package Machinery Corp., Glendale, N. Y.
Grace, W. R., & Co., Cryovac Div., Cambridge, Mass.
Great Lakes Stamp & Mfg. Co., Chicago
•Hayssen Mfg. Co., Sheboygan, Wis.
Heat Sealing Equipment Mfg. Co., Cleveland
Hofliger & Karg, Waiblingen bei Stuttgart, Germany
Ideal Packagings Ltd., London, England
•Industrie-Werke Karlsruhe Aktiengesellschaft, Karlsruhe, Germany
•Mehl Mfg. Co., Cincinnati
•Mercury Heat Sealing Equipment Co., Philadelphia
Minnesota Mining & Mfg. Co., St. Paul, Minn.
Packaging Laboratories & Designing Ltd., Montreal, Que.
•Peters Machinery Co., Chicago
Plageman Enterprises, Inc., Cleveland
•Plas-Ties Co., Santa Ana, Calif.
•Pneumatic Scale Corp., Quincy, Mass.
•Quickpak Machinery Corp., Culver City, Calif.
Richardson Scale Co., Clifton, N. J.
St. Regis Paper Co., New York
•Sanford, William B., Inc., New York
Tempo-Vane Mfg. Co., San Francisco
Tipper Tie Products of New Jersey, Inc., Union, N. J.
Union Bag-Camp Paper Corp., New York
Vac-Tie Fasteners, Inc., Elizabeth, N. J.
Vol-Pak, Inc., New York
•Vertrod Corp., Brooklyn, N. Y.
•Weldotron Corp., Newark, N. J.
•Wright Machinery Co., Div. Sperry Rand Corp., Durham, N. C.

MACHINES, BAG OR ENVELOPE FILLING

Editorial information, Div. III Sec. 12

Aidlin Automation, Inc., Brooklyn, N. Y.
•Amaco, Inc., Chicago
•Amsco Packaging Machinery, Inc., Long Island City, N. Y.
•Arenco Machine Co., New York
Autopack Ltd., Malvern Link, Worcestershire, England
Bag-O-Matic Packaging Equipment Co., Los Angeles
Barraclough, R. W., Ltd., Southport, Lancashire, England
Bemis Bro. Bag Co., St. Louis, Mo.
Black Products Co., Chicago
•Brown Filling Machine Co., Sub. Sundstrand Corp., Ann Arbor, Mich.
•Bursak Packaging Machinery Corp., Jackson, Wis.
•Carbert Mfg. Co., Div. Pneumatic Scale Corp., Quincy, Mass.
Carter Engineering Co., Danville, Ill.
Coddington, E. D., Mfg. Co., Milwaukee
•Consolidated Packaging Machinery Corp., Buffalo, N. Y.
•Continental Can Co., Flexible Packaging Div., Mt. Vernon, Ohio
Delamere & Williams Co., Toronto, Ont.
•Errich International Corp., New York
Exact Weight Scale Co., Columbus, Ohio
Exactron, Inc., Dumont, N. J.
•FMC Corp., Simplex Plant, Oakland, Calif.
•FMC Corp., Stokes & Smith Plant, Philadelphia
Glendale Package Machinery Co., Glendale, N. Y.
•Gump, B. F., Co., Chicago
•Hayssen Mfg. Co., Sheboygan, Wis.
Ideal Packagings Ltd., London, England
•Industrie-Werke Karlsruhe Aktiengesellschaft, Karlsruhe, Germany
•Karstrom Co., Menomonee Falls, Wis.

•Lynch Corp., Anderson, Ind.
Mateer, G. Diehl, Co., Wayne, Pa.
Mettler Instrument Corp., Princeton, N. J.
Minnesota Mining & Mfg. Co., St. Paul, Minn.
•Pack-Rite Machines, Div. Techtmann Industries, Inc., Milwaukee
Plageman Enterprises, Inc., Cleveland
•Pneumatic Scale Corp., Quincy, Mass.
Richardson Scale Co., Clifton, N. J.
St. Regis Paper Co., New York
Southall & Smith Ltd., Birmingham, England
Stuyvesant Engineering Corp., Norwood, N. J.
Tele-Sonic Packaging Corp., New York
•Triangle Package Machinery Co., Chicago
Union Bag-Camp Paper Corp., New York
•U. S. Automatic Box Machinery Co., Boston
Weigh Right Automatic Scale Co., Joliet, Ill.
•Wright Machinery Co., Div. Sperry Rand Corp., Durham, N. C.

MACHINES, BAG OR ENVELOPE MAKING, FILLING & CLOSING

Editorial information, Div. III Sec. 12

•Amaco, Inc., Chicago
•Amsco Packaging Machinery, Inc., Long Island City, N. Y.
Autopack Ltd., Malvern Link, Worcestershire, England
Bag-O-Matic Packaging Equipment Co., Los Angeles
Barraclough, R. W., Ltd., Southport, Lancashire, England
•Bartelt Engineering Co., Rockford, Ill.
•Bodolay, Stephen, Inc., Springfield, Mass.
•Brown Filling Machine Co., Sub. Sundstrand Corp., Ann Arbor, Mich.
•Bursak Packaging Machinery Corp., Jackson, Wis.
Cloud Machine Corp., Skokie, Ill.
•Conapac Corp., New York
•Continental Can Co., Flexible Packaging Div., Mt. Vernon, Ohio
Delamere & Williams Co., Toronto, Ont.
•Diederichs & Griffin Co., Chicago
•FMC Corp., Simplex Plant, Oakland, Calif.
•FMC Corp., Stokes & Smith Plant, Philadelphia
General Packaging Equipment Co., Houston, Texas
Geveke & Co., Elmsford, N. Y.
Glendale Package Machinery Corp., Glendale, N. Y.
Hamac-Hansella Machinery Corp., Palisades Park, N. J.
•Hamac-Hansella Maschinen GmbH, Dusseldorf, Germany
•Hayssen Mfg. Co., Sheboygan, Wis.
•Hesser, Fr., Maschinenfabrik AG, Stuttgart-Bad Cannstatt, Germany
Hofliger & Karg, Waiblingen bei Stuttgart, Germany
Ideal Packagings Ltd., London, England
•Industrie-Werke Karlsruhe Aktiengesellschaft, Karlsruhe, Germany
Ketchpel Engineering Co., W. Englewood, N. J.
Lake Industrial Products Co., Chagrin Falls, Ohio
•Lynch Corp., Anderson, Ind.
•Mehl Mfg. Co., Cincinnati
•Mercury Heat Sealing Equipment Co., Philadelphia
•Package Machinery Co., E. Longmeadow, Mass.
Packaging Frontiers, Inc., Waltham, Mass.
•Pneumatic Scale Corp., Quincy, Mass.
Polyflex Bag & Container, Inc., Johnstown, N. Y.
Pratt Mfg. Corp., Milwaukee
•Quickpak Machinery Corp., Culver City, Calif.
St. Regis Paper Co., New York
Shaw, Frank, Co., Los Angeles
•Triangle Package Machinery Co., Chicago
•Wright Machinery Co., Div. Sperry Rand Corp., Durham, N. C.

MACHINES, BAG OR ENVELOPE OPENING

Editorial information, Div. III Sec. 12

Akron Equipment Co., Akron, Ohio
•Amaco, Inc., Chicago
•Amsco Packaging Machinery, Inc., Long Island City, N. Y.
Anderson Bros. Mfg. Co., Rockford, Ill.
•Arenco Machine Co., New York
Bag-O-Matic Packaging Equipment Co., Los Angeles
Barraclough, R. W., Ltd., Southport, Lancashire, England
•Carbert Mfg. Co., Div. Pneumatic Scale Corp., Quincy, Mass.
Central States Paper & Bag Co., St. Louis, Mo.
•Consolidated Packaging Machinery Corp., Buffalo, N. Y.
•Continental Can Co., Flexible Packaging Div., Mt. Vernon, Ohio
•Errich International Corp., New York
Glendale Package Machinery Co., Glendale, N. Y.
•Gump, B. F., Co., Chicago
•Karstrom Co., Menomonee Falls, Wis.
Tele-Sonic Packaging Corp., New York
Tempo-Vane Mfg. Co., San Francisco
Wellington Associates, Phoenixville, Pa.
•Wright Machinery Co., Div. Sperry Rand Corp., Durham, N. C.

MACHINES, BAG FEEDING, OPENING, FILLING & CLOSING

Editorial information, Div. III Sec. 12

Aidlin Automation, Inc., Brooklyn, N. Y.
•Amaco, Inc., Chicago
•Arenco Machine Co., New York
Automatic Scale Co., New York
Autopack Ltd., Malvern Link, Worcestershire, England
Bag-O-Matic Packaging Equipment Co., Los Angeles
Barraclough, R. W., Ltd., Southport, Lancashire, England
Bemis Bro. Bag Co., St. Louis, Mo.
Brecknell, Dolman & Rogers Ltd., Bristol, England
•Brown Filling Machine Co., Sub. Sundstrand Corp., Ann Arbor, Mich.
•Carbert Mfg. Co., Div. Pneumatic Scale Corp., Quincy, Mass.
•Consolidated Packaging Machinery Corp., Buffalo, N. Y.
•Continental Can Co., Flexible Packaging Div., Mt. Vernon, Ohio
Delamere & Williams Co., Toronto, Ont.
Delta Engineering Corp., Melrose, Mass.
•Errich International Corp., New York
Geveke & Co., Elmsford, N. Y.
Glendale Package Machinery Co., Glendale, N. Y.
•Gump, B. F., Co., Chicago
Hanncon Machine Co., New York
•Hesser, Fr., Maschinenfabrik AG, Stuttgart-Bad Cannstatt, Germany
Hofliger & Karg, Waiblingen bei Stuttgart, Germany
Ideal Packagings Ltd., London, England
•Industrie-Werke Karlsruhe Aktiengesellschaft, Karlsruhe, Germany
•International Paper Co., New York
•Karstrom Co., Menomonee Falls, Wis.
Renka Bagmachines Establishment, Amsterdam, Holland
St. Regis Paper Co., New York
•Sanford, William B., Inc., New York
Union Bag-Camp Paper Corp., New York
•Wright Machinery Co., Div. Sperry Rand Corp., Durham, N. C.

MACHINES, BAG FLATTENING

Editorial information, Div. V Sec. 17

Flexoveyor Mfg. Co., Denver, Colo.
•International Paper Co., New York
Power-Curve Conveyor Co., Denver, Colo.
Rapids-Standard Co., Grand Rapids, Mich.
•Tol-O-Matic, Inc., Minneapolis
Wellington Associates, Phoenixville, Pa.

MACHINES, BAG MAKING

Editorial information, Div. III Sec. 12, 14

Altair Machinery Corp., New York
American Thermoform Corp., Culver City, Calif.
•Amsco Packaging Machinery, Inc., Long Island City, N. Y.
Autopack Ltd., Malvern Link, Worcestershire, England
Barraclough, R. W., Ltd., Southport, Lancashire, England
Chaffee, Ralph, & Co., San Francisco
Cobden Chadwick Ltd., Oldham, Lancs., England
•Conapac Corp., New York
•Diederichs & Griffin Co., Chicago
•FMC Corp., Simplex Plant, Oakland, Calif.
•Hamac-Hansella Maschinen GmbH, Dusseldorf, Germany
•Heinrich Equipment Corp., New York
•Manhasset Machine Co., Amityville, N. Y.
Miller Wrapping & Sealing Machine Co., Chicago
Moore, Kenneth J., & Co., Chicago
Potdevin Machine Co., Teterboro, N. J.
Renka Bagmachines Establishment, Amsterdam, Holland
St. Regis Paper Co., New York
Schjeldahl, G. T., Co., Northfield, Minn.
Sealaround Corp., Chicago
Smith & Winchester Mfg. Co., So. Windham, Conn.
Stokes, F. J., Corp., Philadelphia
Weber, H. G., & Co., Kiel, Wis.
•Wright Machinery Co., Div. Sperry Rand Corp., Durham, N. C.

MACHINES, BAG SEWING

Editorial information, Div. III Sec. 14

Bemis Bro. Bag Co., St. Louis, Mo.
•Consolidated Packaging Machinery Corp., Buffalo, N. Y.
Fischbein, Dave, Co., Minneapolis
•International Paper Co., New York
Mayflower Electronic Devices, Inc., Little Ferry, N. J.
Potdevin Machine Co., Teterboro, N. J.
St. Regis Paper Co., New York
Thimonnier & Cie., Lyon, France
Union Bag-Camp Paper Corp., New York

MACHINES, BAG STAPLING

Editorial information, Div. III Sec. 13

Bates Mfg. Co., W. Orange, N. J.
•Bostitch, Inc., E. Greenwich, R. I.
Ideal Stitcher Co., Div. W. R. Pabich Mfg. Co., Chicago

Saranac Machine Co., Benton Harbor, Mich.
Staplex Co., Brooklyn, N. Y.
•Trescott Co., Fairport, N. Y.
Vickers-Armstrongs (Engineers) Ltd., London, England

MACHINES, BAG VALVING

Editorial information, Div. III Sec. 12, 14

Potdevin Machine Co., Teterboro, N. J.
St. Regis Paper Co., New York

MACHINES, BALE LOADING & SEALING

Editorial information, Div. III Sec. 14

Consolidated Baling Machine Co., Brooklyn, N. Y.
•Emhart Mfg. Co., Portland Div., Portland, Conn.
General Bag Equipment Corp., Cleveland
•Hayssen Mfg. Co., Sheboygan, Wis.
St. Regis Paper Co., New York
Salwasser Mfg. Co., Reedley, Calif.
•Tol-O-Matic, Inc., Minneapolis

MACHINES, BALE SEALING

Editorial information, Div. III Sec. 14

General Bag Equipment Corp., Cleveland
•Packomatic Div., Textile Machine Works, Reading, Pa.
St. Regis Paper Co., New York
•Tol-O-Matic, Inc., Minneapolis

MACHINES, BANDING & WIRE STRAPPING

Editorial information, Div. V Sec. 17

•Acme Steel Co., Chicago
Allegheny Steel Band Co., Pittsburgh
General Strapping Corp., New York
Gerrard, A. J., & Co., Des Plaines, Ill.
Guide Co., Canfield, Ohio
Inland Wire Products Co., Crawfordsville, Ind.
•Packomatic Div., Textile Machine Works, Reading, Pa.
Paper Converting Machine Co., Green Bay, Wis.
Signode Steel Strapping Co., Chicago
U. S. Steel Supply Div., United States Steel Corp., Chicago
Wiretyer Corp., E. Paterson, N. J.

MACHINES, BLOW MOLDING

Editorial information, Div. III Sec. 14

•Abbott Plastic Machine Corp., Chicago
•Atlas Vac-Machine Corp., Rochester, N. Y.
Auto-Blow Corp., Div. National Cleveland Corp., Fairfield, Conn.
Baumann, Franz, & Co., Zurich, Switzerland
•Conapac Corp., New York
Delamere & Williams Co., Toronto, Ont.
•Index Industrial Corp., New York
•Modern Plastic Machinery Corp., Clifton, N. J.
Moslo Machinery Co., Cleveland
Prodex Corp., Fords, N. J.
•Producto Machine Co., Bridgeport, Conn.
Royle, John, & Sons, Paterson, N. J.
Stokes, F. J., Corp., Philadelphia
•Waldron-Hartig Div., Midland-Ross Corp., New Brunswick, N. J.

MACHINES, BOTTLE SPOTTING

A. Air
B. Washing

Editorial information, Div. III Sec. 12

•Amaco, Inc., Chicago (B)
Ampoule Machine Co., Long Island City, N. Y. (B)
Barry-Wehmiller Machinery Co., St. Louis, Mo. (A, B)
Biner-Ellison Machinery Co., Los Angeles (A)
Builders Sheet Metal Works, Inc., New York (A)
•Chisholm-Ryder Co. of Pa., Hanover, Pa. (A)
•Continental Can Co., White Cap Co., Div., Chicago (A)
Cozzoli Machine Co., Plainfield, N. J. (A, B)
Delamere & Williams Co., Toronto, Ont. (A, B)
Elgin Mfg. Co., Elgin, Ill. (A)
Eyrle Co., San Francisco (A, B)
Griswold Engineering Ltd., Montreal, Que. (A)
Kiefer, Karl, Machine Co., Cincinnati (A, B)
Laub Engineering Co., San Gabriel, Calif. (B)
•MRM Co., Plainview, N. Y. (A)
Meyer, Geo. J., Mfg. Co., Cudahy, Wis. (B)
Miller Hydro Co., Bainbridge, Ga. (B)
Modern Packaging Machinery Co., Van Nuys, Calif. (A)
Perl Machine Mfg. Co., Brooklyn, N. Y. (A, B)
•Perry Industries, Inc., Brooklyn, N. Y. (B)
•Pneumatic Scale Corp., Quincy, Mass. (A)
Pratt Mfg. Corp., Milwaukee (B)
•Production Equipment, Inc., Div. Burnet Co., Paramus, N. J. (B)
•Sanford, William B., Inc., New York (A)
U. S. Bottlers Machinery Co., Chicago (A, B)
Wellington Associates, Phoenixville, Pa. (B)

MACHINES, BOTTLE FILLING, LIQUID

(See Machines, Filling, Liquid)

MACHINES, BOTTLE SPOTTING

(Automatic)

Editorial information, Div. III Sec. 12

Gisholt Machine Co., Madison, Wis.
Meyer, Geo. J., Mfg. Co., Cudahy, Wis.

MACHINES, BOW MAKING

Editorial information, Div. IV Sec. 15

Minnesota Mining & Mfg. Co., St. Paul, Minn.
Texlon Corp., Dallas, Texas

MACHINES, BOX COLLAPSING

Editorial information, Div. III Sec. 12, 13

Ex-Cell-O Corp., Ex-Cell-O-Staude Dept., Detroit
•International Paper Box Machine Co., Nashua, N. H.
•U. S. Automatic Box Machinery Co., Boston

MACHINES, BOX MAKING

(Folding)

Editorial information, Div. III Sec. 14

Crandall, Inc., Oak Park, Ill.
Ex-Cell-O Corp., Ex-Cell-O-Staude Dept., Detroit
Fulton Machinery Co., Chicago
Greggory, Inc., Chicago
•International Paper Box Machine Co., Nashua, N. H.
•Mercury Engineering Corp., Sub. Miehle-Goss-Dexter, Inc., Milwaukee
•Miehle Co., Div. Miehle-Goss-Dexter, Inc., Chicago
Package Forming Machinery Co., Toronto, Ont.
•Packomatic Div., Textile Machine Works, Reading, Pa.
Thomson-National Press Co., Franklin, Mass.
•United Shoe Machinery Corp., Boston
•U. S. Automatic Box Machinery Co., Boston
Vickers-Armstrongs (Engineers) Ltd., London, England
Weverhaeuser Co., Boxboard & Folding Carton Div., Chicago

MACHINES, BOX MAKING

(Set-Up)

Editorial information, Div. III Sec. 14

•Beck, Charles, Machine Corp., King of Prussia, Pa.
•FMC Corp., Stokes & Smith Plant, Philadelphia
Globe Mfg. Co., Philadelphia
Greggory, Inc., Chicago
•International Paper Box Machine Co., Nashua, N. H.
•Knowlton, M. D., Co., Rochester, N. Y.
Lake Industrial Products Co., Chagrin Falls, Ohio
•New Jersey Machine Corp., Hoboken, N. J.
Package Forming Machinery Co., Toronto, Ont.
Standard Paper Box Machine Co., New York
Thomson-National Press Co., Franklin, Mass.
Vickers-Armstrongs (Engineers) Ltd., London, England

MACHINES, BOX MAKING CORRUGATED

(Adjustable for Size)

Editorial information, Div. III Sec. 14

Auto Case Machinery Co., Richmond, Va.
Colt Packaging Machinery Co., Cranston, R. I.
•General Corrugated Machinery Co., Palisades Park, N. J.
Greggory, Inc., Chicago
Huntingdon Industries, Inc., Bethayres, Pa.
•International Paper Box Machine Co., Nashua, N. H.
Liberty Engineering Co., Beloit, Wis.
•Mitsui & Co., Tokyo, Japan
Package Forming Machinery Co., Toronto, Ont.
St. Regis Paper Co., New York
Thomson-National Press Co., Franklin, Mass.
Universal Corrugated Box Machinery Corp., Linden, N. J.
Vickers-Armstrongs (Engineers) Ltd., London, England

MACHINES, BOX STAYING

(Stay Tape)

Editorial information, Div. III Sec. 14

•FMC Corp., Stokes & Smith Plant, Philadelphia
Globe Mfg. Co., Philadelphia
•Knowlton, M. D., Co., Rochester, N. Y.
•New Jersey Machine Corp., Hoboken, N. J.
Standard Paper Box Machine Co., New York
Vickers-Armstrongs (Engineers) Ltd., London, England

MACHINES, BOX WINDOW APPLYING

Editorial information, Div. III Sec. 14

Ex-Cell-O Corp., Ex-Cell-O-Staude Dept., Detroit
•Hesser, Fr., Maschinenfabrik AG, Stuttgart-Bad Cannstatt, Germany
•International Paper Box Machine Co., Nashua, N. H.
Lerner Machine Co., Ponders End, Middx., England

MACHINES, BUNDLING

Editorial information, Div. III Sec. 12

•Amsco Packaging Machinery, Inc., Long Island City, N. Y.
Anderson Bros. Mfg. Co., Rockford, Ill.
Ayers & Grimshaw Ltd., Barnstaple, Devon, England
•Battle Creek Packaging Machines, Inc., Battle Creek, Mich.
Clavell Bate & Nephews Ltd., Nelson, Lancashire, England
•Diederichs & Griffin Co., Chicago
Elgin Mfg. Co., Elgin, Ill.
Geveke & Co., Elmsford, N. Y.
Guide Co., Canfield, Ohio
Hamilton Tool Co., Hamilton, Ohio
•Hayssen Mfg. Co., Sheboygan, Wis.
•Hesser, Fr., Maschinenfabrik AG, Stuttgart-Bad Cannstatt, Germany
Lerner Machine Co., Ponders End, Middx., England
Liberty Engineering Co., Beloit, Wis.
Miller Wrapping & Sealing Machine Co., Chicago
Minnesota Mining & Mfg. Co., St. Paul, Minn.
•Package Machinery Co., E. Longmeadow, Mass.
Paper Converting Machine Co., Green Bay, Wis.
St. Regis Paper Co., New York
•Scandia Packaging Machinery Co., No. Arlington, N. J.
Supermatic Packaging Corp., Union, N. J.
Union Bag-Camp Paper Corp., New York
West Engineering Co., Richmond, Va.
Wiretyer Corp., E. Paterson, N. J.

MACHINES, CAN CLOSING & SEALING

Editorial information, Div. III Sec. 12, 14

•American Can Co., Canco Div., New York
Ams, Max, Machine Co., Bridgeport, Conn.
Angelus Sanitary Can Machine Co., Los Angeles, Calif.
•Bliss, E. W., Co., Canton, Ohio
Builders Sheet Metal Works, Inc., New York
•Colton, Arthur, Co., Detroit
•Continental Can Co., Metal Div., New York
Crandall Can Filler Machine Co., Buffalo, N. Y.
•FMC Corp., Canning Machinery Div., San Jose, Calif.
Minnesota Mining & Mfg. Co., St. Paul, Minn.
Nalbach, John R., Engineering Co., Chicago
•Newman Tool Co., New York
•Resina Automatic Machinery Co., Brooklyn, N. Y.
Rockport Machine & Tool Co., Cleveland
Scientific Filter Co., New York

MACHINES, CAN LABELING

Editorial information, Div. III Sec. 12

Avery Label Co., Div. Avery Adhesive Products, Inc., Monrovia, Calif.
Barry-Wehmiller Machinery Co., St. Louis, Mo.
Biner-Ellison Machinery Co., Los Angeles
Burt Machine Co., Baltimore, Md.
•Chisholm-Ryder Co. of Pa., Hanover, Pa.
•Emhart Mfg. Co., Portland Div., Portland, Conn.
•FMC Corp., Canning Machinery Div., San Jose, Calif.
Glue-Fast Equipment Co., New York
•Labelette Co., Chicago
•MRM Co., Plainview, N. Y.
Minnesota Mining & Mfg. Co., St. Paul, Minn.
Moore, Kenneth J., & Co., Chicago
•Pneumatic Scale Corp., Quincy, Mass.
•Sanford, William B., Inc., New York
Scientific Filter Co., New York
Wellington Associates, Phoenixville, Pa.

MACHINES, CAN MAKING

Editorial information, Div. III Sec. 14

•American Can Co., Canco Div., New York
Ams, Max, Machine Co., Bridgeport, Conn.
Baldwin-Lima-Hamilton Corp., Industrial Equipment Div., Philadelphia
•Bliss, E. W., Co., Canton, Ohio
Herlan, F., Machinery Corp., New York
National Machinery Co., Tiffin, Ohio
Rockport Machine & Tool Co., Cleveland
Verson Allsteel Press Co., Chicago

MACHINES, CAN WRAPPING

Editorial information, Div. III Sec. 12

Andre Paper Box Co., San Leandro, Calif.
Clavell Bate & Nephews Ltd., Nelson, Lancashire, England
•Diederichs & Griffin Co., Chicago
Elgin Mfg. Co., Elgin, Ill.
•FMC Corp., Canning Machinery Div., San Jose, Calif.
Ganz Brothers, Inc., Bergenfield, N. J.

MACHINES, CAP & COVER LINING

Editorial information, Div. III Sec. 14

Johnson, A., Machine Works, Inc., E. Paterson, N. J.
Newman Labelling Machines Ltd., Barnet, Herts., England

MACHINES, CAPPING

A. Aerosol Containers
B. Bottles & Jars
C. Cans
D. Collapsible Tubes
E. Paper, Foil, Plastic Containers

Editorial information, Div. III Sec. 12

Aidlin Automation, Inc., Brooklyn, N. Y. (B)
Allied Equipment Co., Yonkers, N. Y. (B)
•Aluminum Co. of America, Pittsburgh (A, B, C)
•Amaco, Inc., Chicago (B, E)
•American Can Co., Canco Div., New York (C)
•Anaconda Aluminum Co., Louisville, Ky. (E)
•Anchor Hocking Glass Corp., Lancaster, Ohio (B)
Andora Automation, Inc., Brooklyn, N.Y. (A, B, C)
Biner-Ellison Machinery Co., Los Angeles (B)
•Bliss, E. W., Co., Canton, Ohio (C)
Builders Sheet Metal Works, Inc., New York (A)
•Carbert Mfg. Co., Div. Pneumatic Scale Corp., Quincy, Mass. (B)
Chase Equipment Co., Div. C. W. Logeman Co., Brooklyn, N. Y. (B, E)
•Consolidated Packaging Machinery Corp., Buffalo, N. Y. (A, B, C)
•Continental Can Co., White Cap Co., Div., Chicago (B)
Cornelius, Theodore, New York (C)
Crandall Can Filler Machine Co., Buffalo, N. Y. (C)
•Crown Cork & Seal Co., Philadelphia (B)
Dairy Whipt Div., Aerated Container Corp., Chicago (A)
Delamere & Williams Co., Toronto, Ont. (B)
•Ekco-Alcoa Containers, Inc., Wheeling, Ill. (E)
Elgin Mfg. Co., Elgin, Ill. (B, C)
•Ertel Engineering Corp., Kingston, N. Y. (B, C)
Eyrle Co., San Francisco (B)
Filler Machine Co., Philadelphia (C)
Filpaco Industries, Inc., Chicago (B, C)
Formed Container Corp., Sub. Phillips Petroleum Co., Orangeburg, N. Y. (E)
Formvac, Zurich, Switzerland (E)
Herlan, F., Machinery Corp., New York (D)
Hofliger & Karg, Waiblingen bei Stuttgart, Germany (B)
•Index Industrial Corp., New York (D)
Kahlenberg-Globe Equipment Co., Sarasota, Fla. (B)
Laub Engineering Co., San Gabriel, Calif. (B, C)
Lily-Tulip Cup Corp., New York (E)
•Metal Closures Ltd., West Bromwich, Staffordshire, England (B)
Mid-West-Pak Corp., Belvidere, Ill. (B, E)
•Mojonnier, Albert, Inc., Franklin Park, Ill. (E)
•National Equipment Corp., New York (D)
•PMC Industries, Hackensack, N. J. (A, B, C, D, E)
•Packomatic Div., Textile Machine Works, Reading, Pa. (E)
•Perry Industries, Inc., Brooklyn, N. Y. (A, B)
•Pneumatic Scale Corp., Quincy, Mass. (A, B, C)
•Pressure Pak, Inc., W. Palm Beach, Fla. (A)
•Resina Automatic Machinery Co., Brooklyn, N. Y. (B, C)
Roberts Patent Filling Machine Co., Bolton, Lancs., England (B, C, D)
Rockport Machine & Tool Co., Cleveland (C, E)

Roll-O-Sheets, Inc., St. Louis, Mo. (E)
Saga Packaging Machinery Div., A & M Tool & Die Co., Southbridge, Mass. (E)
•Sanford, William B., Inc., New York (B, C)
•Scandia Packaging Machinery Co., No. Arlington, N. J. (E)
Scientific Filter Co., New York (A, B, C, E)
Sealright Co., Fulton, N. Y. (B)
•Swanson, W. H., & Co., Wilmette, Ill. (B, C, E)
West Co., Phoenixville, Pa. (B)

MACHINES, CAPSULE FILLING

Editorial information, Div. III Sec. 12

•Amaco, Inc., Chicago
Chase Equipment Co., Div. C. W. Logeman Co., Brooklyn, N. Y.
Chemical & Pharmaceutical Industry Co., New York
•Colton, Arthur, Co., Detroit
Delta Engineering Corp., Melrose, Mass.
Hofliger & Karg, Waiblingen bei Stuttgart, Germany
•Karstrom Co., Menomonee Falls, Wis.
•National Equipment Corp., New York
•Perry Industries, Inc., Brooklyn, N. Y.
Tanzi, Aurelio, Engineering Co., Brooklyn, N. Y.

MACHINES, CARRIER-CARTONING

Editorial information, Div. III Sec. 12

Andre Paper Box Co., San Leandro, Calif.
Autopack Ltd., Malvern Link, Worcestershire, England
•Bartelt Engineering Co., Rockford, Ill.
Container Corp. of America, Chicago
•Continental Can Co., Folding Carton & Drum Div., New York
Dacam Corp., Charlotte, N. C.
•Diederichs & Griffin Co., Chicago
•Gardner Div., Diamond National Corp., Middletown, Ohio
Green Bay Box Co., Green Bay, Wis.
Interstate Folding Box Co., Middletown, Ohio
Johns-Nigrelli-Johns, Skokie, Ill.
•Jones, R. A., & Co., Cincinnati
King Sales & Engineering Co., San Francisco
Los Angeles Paper Box & Board Mills, Los Angeles
Mead Packaging Div., Mead Corp., Atlanta, Ga.
•Olin, Packaging Div., Forest Products Operations, W. Monroe, La.
Rex Packaging Machine Co., Rahway, N. J.
•Standard Packaging Corp., Bradley & Gilbert Div., Louisville, Ky.
Western Gear Corp., Lynwood, Calif.
Weyerhaeuser Co., Boxboard & Folding Carton Div., Chicago

MACHINES, CARTON HANDLING

A. Forming
B. Lining
C. Closing
D. Forming, Filling & Closing
E. Forming, Lining, Filling & Closing

Editorial information, Div. III Sec. 12

•Amaco, Inc., Chicago (C, D, E)
Anderson Bros. Mfg. Co., Rockford, Ill. (D)
Auto Wrappers (Norwich) Ltd., Norwich, England (A, C)
Autopack Ltd., Malvern Link, Worcestershire, England (A, B, C, D, E)
•Battle Creek Packaging Machines, Inc., Battle Creek, Mich. (A, B, C, D, E)
Bellamy, J. B., & Co., San Francisco (A, C)
•Bivans Corp., Los Angeles (A, C)
Chicago Carton Co., Div. Waldorf Paper Products Co., Chicago (A, B, C, D, E)
Clavell Bate & Nephews Ltd., Nelson, Lancashire, England (A)
•Clybourn Machine Corp., Chicago (D)
•Container Equipment Corp., Bloomfield, N. J. (C)
•Continental Can Co., Folding Carton & Drum Div., New York (A, C, D)
Continental Folding Paper Box Co., Ridgefield, N. J. (A, C)
Crandall, Inc., Oak Park, Ill. (A)
Dacam Corp., Charlotte, N. C. (D)
Delamere & Williams Co., Toronto, Ont. (A, B, C, D)
Ex-Cell-O Corp., Ex-Cell-O-Staude Dept., Detroit (D)
•FMC Corp., Stokes & Smith Plant, Philadelphia (A, D, E)
•Foils Packaging Corp., Cincinnati (A, C, D, E)
•Gardner Div., Diamond National Corp., Middletown, Ohio (A, C, D, E)
Geveke & Co., Elmsford, N. Y. (A, B, C, D, E)
•Hesser, Fr., Maschinenfabrik AG, Stuttgart-Bad Cannstatt, Germany (D, E)
Hofliger & Karg, Waiblingen bei Stuttgart, Germany (D)
Ideal Packagings Ltd., London, England (A, C, D)
Interstate Folding Box Co., Middletown, Ohio (C)
Johns-Nigrelli-Johns, Skokie, Ill. (D)
•Jones, R. A., & Co., Cincinnati (A, D)
Kliklok, Automated Packaging Div., Atlas General Industries, Inc., New York (A, B, C, D, E)
Lathrop Paulson Co., Chicago (C)
Lord Baltimore Press, Inc., New York (D)
•Lynch Corp., Anderson, Ind. (D)
Mead Containers, Div. The Mead Corp., Cincinnati (A)
Midway Machine Co., St. Paul, Minn. (A, C, D)
Minnesota Mining & Mfg. Co., St. Paul, Minn. (C)
Molins Machine Co., Richmond, Va. (D, E)
•New Jersey Machine Corp., Hoboken, N. J. (A, C)
•Olin, Packaging Div., Forest Products Operations, W. Monroe, La. (D)
Package Forming Machinery Co., Toronto, Ont. (A, B, C)
•Package Machinery Co., E. Longmeadow, Mass (A, C)
•Packomatic Div., Textile Machine Works, Reading, Pa. (A, B, D, E)
•Peters Machinery Co., Chicago (A, B, C, D)
Phillips Associates, Oakland, Calif. (C, D)
•Pneumatic Scale Corp., Quincy, Mass. (A, B, C, D, E)
R E B Trays, Inc., Flourtown, Pa. (A, C)
•Redington Div., Crompton & Knowles Packaging Corp., Bellwood, Ill. (A, B, C, D, E)
Rex Packaging Machine Co., Rahway, N. J. (A, C, D)
St. Regis Paper Co., New York (A, C)
•Sanford, William B., Inc., New York (A, B, C, D, E)
•Scandia Packaging Machinery Co., No. Arlington, N. J. (D)
Sealright Co., Fulton, N. Y. (D)
Standard Folding Trays Corp., Jackson Heights, N. Y. (D)
Thiele Packaging Machinery Co., Div. Stainless & Steel Products Co., St. Paul, Minn. (A, C)
•Triangle Package Machinery Co., Chicago (A, C, D)
•U. S. Automatic Box Machinery Co., Boston (A, B, C, D, E)
Universal Folding Box Co., Hoboken, N. J. (A)
Weigh Right Automatic Scale Co., Joliet, Ill. (C, D)
Weyerhaeuser Co., Boxboard & Folding Carton Div., Chicago (A, B, C, D, E)
Wilcox Mfg. Co., Stockton, Calif. (A)

MACHINES, CARTON OPENING, LOADING, CLOSING

(CARTONERS)

Editorial information, Div. III Sec. 12

•Amaco, Inc., Chicago
Autopack Ltd., Malvern Link, Worcestershire, England
•Bartelt Engineering Co., Rockford, Ill.
•Clybourn Machine Corp., Chicago
•Container Equipment Corp., Bloomfield, N. J.
•Continental Can Co., Folding Carton & Drum Div., New York
•Diederichs & Griffin Co., Chicago
•Gardner Div., Diamond National Corp., Middletown, Ohio
Glendale Package Machinery Corp., Glendale, N. Y.
Hofliger & Karg, Waiblingen bei Stuttgart, Germany
Ideal Packagings Ltd., London, England
•Industrie-Werke Karlsruhe Aktiengesellschaft, Karlsruhe, Germany
•Jones, R. A., & Co., Cincinnati
•Lynch Corp., Anderson, Ind.
•New Jersey Machine Corp., Hoboken, N. J.
•Package Machinery Co., E. Longmeadow, Mass.
•Redington Div., Crompton & Knowles Packaging Corp., Bellwood, Ill.
•Sanford, William B., Inc., New York
Thiele Packaging Machinery Co., Div. Stainless & Steel Products Co., St. Paul, Minn.
•Triangle Package Machinery Co., Chicago
•U. S. Automatic Box Machinery Co., Boston
We er, H. G., & Co., Kiel, Wis.
Wilcox Mfg. Co., Stockton, Calif.

MACHINES, CASE HANDLING

A. Opening
B. Unloading
C. Loading or Filling
D. Sealing, Glue
E. Sealing, Gummed Tape
F. Stitching
G. Printing

Editorial information, Div. III Sec. 12

A-B-C Packaging Machine Corp., Clearwater, Fla. (A, B, C, D)
Alvey-Ferguson Co., Cincinnati (C)
Anderson Bros. Mfg. Co., Rockford, Ill. (C)
Atkron, Inc., Cuyahoga Falls, Ohio (A, B)
Auto-Case Machinery Co., Richmond, Va. (C, D, E)
Barraclough, R. W., Ltd., Southport, Lancashire, England (C)
Barry-Wehmiller Machinery Co., St. Louis, Mo. (B, C)
•Bostitch, Inc., E. Greenwich, R. I. (F)
Brady Conveyors Corp., Skokie, Ill. (B)
Burt Machine Co., Baltimore, Md. (C)
Caral Packaging Machinery, Inc., Albany, Calif. (A, C)

•Chisholm-Ryder Co. of Pa., Hanover, Pa. (C, D)
Climax Products Div., Lodge & Shipley Co., Cincinnati (A, B, C, D)
•Clybourn Machine Corp., Chicago (D, E)
Dacam Corp., Charlotte, N. C. (C)
Delamere & Williams Co., Toronto, Ont. (B, D)
•Diederichs & Griffin Co., Chicago (A, B, C, D, E)
•Economic Machinery Co., Worcester, Mass. (A, B, C)
Elliott Mfg. Co., Fresno, Calif. (A, C, D)
•Emhart Mfg. Co., Portland Div., Portland, Conn. (A, B, C, D, E)
•FMC Corp., Canning Machinery Div., San Jose, Calif. (C, D)
•FMC Corp., Stokes & Smith Plant, Philadelphia (A, C, D)
Flexoveyor Mfg. Co., Denver, Colo. (B, C)
•Foils Packaging Corp., Cincinnati (D)
•General Corrugated Machinery Co., Palisades Park, N. J. (D, E)
General Machinery Corp., Sheboygan, Wis. (A, C, D)
Glue-Fast Equipment Co., New York (D)
•Hesser, Fr., Maschinenfabrik AG, Stuttgart-Bad Cannstatt, Germany (A, C)
Huntingdon Industries, Inc., Bethayres, Pa. (A, C, D, F)
International Staple & Machine Co. Herrin, Ill. (F)
Johns-Nigrelli-Johns, Skokie, Ill. (C)
•Jones, R. A., & Co., Cincinnati (A, C, D)
King Sales & Engineering Co., San Francisco (C)
Laub Engineering Co., San Gabriel, Calif. (A, B, C, D)
Liberty Engineering Co., Beloit, Wis. (D)
Marsh Stencil Machine Co., Belleville, Ill. (E)
Meyer, Geo. J., Mfg. Co., Cudahy, Wis. (A, B, C)
•Midnight Engineering Co., Chicago (E)
Miller Hydro Co., Bainbridge, Ga. (C)
Milwaukee Tool & Machine Co., Milwaukee (E)
•National Equipment Corp., New York (D)
•PMC Industries, Hackensack, N. J. (C)
•Packomatic Div., Textile Machine Works, Reading, Pa. (A, C, D)
Power Curve Conveyor Co., Denver, Colo. (A, B)
•Redington Div., Crompton & Knowles Packaging Corp., Bellwood, Ill. (A, C, D)
Salwasser Mfg. Co., Reedley, Calif. (A, C, D)
•Sanford, William B., Inc., New York (A, C, D, G)
Schroeder Machines Corp., E. Syracuse, N. Y. (A, C, D)
Thiele Packaging Machinery Co., Div. Stainless & Steel Products Co., St. Paul, Minn. (A, C, D)
Union Bag-Camp Paper Corp., New York (D)
Universal Corrugated Box Machinery Corp., Linden, N. J. (E)
Weber, H. G., & Co., Kiel, Wis. (A, C, D)
•Wrap-King Div., Crompton & Knowles Packaging Corp., Agawam, Mass. (A, C, D, G)

MACHINES, CELLULOSE BAND APPLYING

Editorial information, Div. III Sec. 12

•Battle Creek Packaging Machines, Inc., Battle Creek, Mich.
•Diederichs & Griffin Co., Chicago
•Economic Machinery Co., Worcester, Mass.
Eyrle Co., San Francisco
Gisholt Machine Co., Madison, Wis.

MACHINES, COATING

A. Extrusion
B. General
C. Lacquer & Varnish
D. Wax & Hot Melt

Editorial information, Div. III Sec. 14

Abbott Eastern Machinery Sales Corp., New York (C)
•Abbott Plastic Machine Corp., Chicago (C)
Aeroil Products Co., So. Hackensack, N. J. (D)
Anodyne, Inc., No. Miami Beach, Fla. (C)
•Apex Machine Co., College Point, N. Y. (C)
•Appleton Machine Co., Appleton, Wis. (C, D)
•Black-Clawson Co., Dilts Div., Fulton, N. Y. (A, B, C, D)
•Colton, Arthur, Co., Detroit (B)
Condes Corp., Milwaukee (B)
DeVilbiss Co., Toledo, Ohio (C)
•Dexter Co., Div. Miehle-Goss-Dexter, Inc., Chicago (C)
•Diederichs & Griffin Co., Chicago (D)
•Dusenbery, John, Co., Clifton, N. J. (C, D)
Egan, Frank W., & Co., Somerville, N. J. (A, B, C, D)
•FMC Corp., Hudson-Sharp Plant, Green Bay, Wis. (C, D)
Faustel, Inc., Butler, Wis. (B, C, D)
H & W Machinery Corp., Richmond Hill, N. Y. (D)
•Index Industrial Corp., New York (C)
•Inta-Roto Machine Co., Richmond, Va. (B, C, D)
•International Paper Box Machine Co., Nashua, N. H. (D)
Ketchpel Engineering Co., W. Englewood, N. J. (B)
•Knowlton, M. D., Co., Rochester, N. Y. (B, D)
Kohler Coating Machinery Corp., Greentown, Ohio (B, C, D)
Mecca Machinery Co., Long Island City, N. Y. (C, D)
•Modern Plastic Machinery Corp., Clifton, N. J. (A)
Moore, Kenneth J., & Co., Chicago (B, C, D)
Oakland Paper Box Co., Emeryville, Calif. (D)
Ortman-McCain Co., Chicago (D)
Pan Industrial Corp., New York (B, C)
Paper Machinery Corp., Milwaukee (D)
Potdevin Machine Co., Teterboro, N. J. (B, C, D)
Prodex Corp., Fords, N. J. (A)
Royle, John, & Sons, Paterson, N. J. (A)
St. Regis Paper Co., New York (B)
Seal-Peel, Inc., Royal Oak, Mich. (D)
Shannon, Alexander J., Co., Fonda, N. Y. (B, C)
Sterling Extruder Corp., Linden, N. J. (A)
Stokes, F. J., Corp., Philadelphia (B)
•Waldron-Hartig Div., Midland-Ross Corp., New Brunswick, N. J. (A, B, C, D)
Wilco Machine Works, Inc., Memphis, Tenn. (A, C, D)

MACHINES, CODING, NUMBERING, IMPRINTING OR PERFORATING

Editorial information, Div. III Sec. 13

•Ackerman Gould Co., Oceanside, N. Y.
Acro Tool & Die Works, Chicago
Ampoule Machine Co., Long Island City, N. Y.
•Apex Machine Co., College Point, N. Y.
Atlas Labeling Machine Corp., Long Island City, N. Y.
Automatic Marking Equipment, Inc., New York
Ayers & Grimshaw Ltd., Barnstaple, Devon, England
Barry-Wehmiller Machinery Co., St. Louis, Mo.
Bates Mfg. Co., W. Orange, N. J.
•Beck, Charles, Machine Corp., King of Prussia, Pa.
•Bell-Mark Corp., Bloomfield, N. J.
Bemis Bro. Bag Co., St. Louis, Mo.
•Carbert Mfg. Co., Div. Pneumatic Scale Corp., Quincy, Mass.
Chicago Carton Co., Div. Waldorf Paper Products Co., Chicago
•Colton, Arthur, Co., Detroit
•Continental Can Co., Folding Carton & Drum Div., New York
•Continental Can Co., White Cap Co., Div., Chicago
Cornelius, Theodore, New York
Coughlin Mfg. Co., New York
Cozzone Marking Co., Newark, N. J.
Dairy Whipt Div., Aerated Container Corp., Chicago
•Dennison Mfg. Co., Framingham, Mass.
Easy-Mark, Inc., Lowell, Mass.
Elliott Mfg. Co., Fresno, Calif.
•Emhart Mfg. Co., Portland Div., Portland, Conn.
Ex-Cell-O Corp., Ex-Cell-O-Staude Dept., Detroit
•FMC Corp., Canning Machinery Div., San Jose, Calif.
Faustel, Inc., Butler, Wis.
Force, Wm. A., & Co., Brooklyn, N. Y.
•Gottscho, Adolph, Inc., Hillside, N. J.
•Griffin-Rutgers, Inc., Scarsdale, N. Y.
•Harley, E. L., Inc., Brooklyn, N. Y.
•Industrial Marking Equipment Co., Brooklyn, N. Y.
International Eastern Co., New York
•Jones, R. A., & Co., Cincinnati
•Kartridg Pak Co., Mount Prospect, Ill.
•Kensol-Olsenmark, Inc., New York
Kimball, A., Co., Brooklyn, N. Y.
Kiwi Coders Corp., Chicago
Kliklok, Automated Packaging Div., Atlas General Industries, Inc., New York
Lerner Machine Co., Ponders End, Middx., England
•Main, Robert A., & Sons, Inc., Wyckoff, N. J.
•Markem Machine Co., Keene, N. H.
Marsh Stencil Machine Co., Belleville, Ill.
Matthews, Jas. H., & Co., Pittsburgh
Muskegon Marking Equipment Co., Packaging Supplies Div., Muskegon, Mich.
Nalbach, John R., Engineering Co., Chicago
•New Jersey Machine Corp., Hoboken, N. J.
•Oliver Machinery Co., Grand Rapids, Mich.
•Package Machinery Co., E. Longmeadow, Mass.
•Packomatic Div., Textile Machine Works, Reading, Pa.
Pannier Corp., Pittsburgh
Pitney-Bowes, Inc., Stamford, Conn.
Pratt Mfg. Corp., Milwaukee
Pryor Marking Products, Chicago
Quality Machine Co., Athens, Ga.
•Redington Div., Crompton & Knowles Packaging Corp., Bellwood, Ill.
Robins Engineering Co., No. Haven, Conn.
Rockford Machine & Tool Co., Cleveland
Sohn Mfg., Inc., Elkhart Lake, Wis.
Swan Machine Co., New York
Thomas Engineering Co., Skokie, Ill.
Thomson-National Press Co., Franklin, Mass.
•Tol-O-Matic, Inc., Minneapolis
•Tompkins' Label Service, Philadelphia
Van Buskirk & Co., Bridgeport, Conn.
Verner, B., & Co., New York
•Wrap-King Div., Crompton & Knowles Packaging Corp., Agawam, Mass.

MACHINES, COLLAPSIBLE TUBE FILLING & CLOSING

Editorial information, Div. III Sec. 12

Anderson Bros. Mfg. Co., Rockford, Ill.
•Arenco Machine Co., New York
•Carbert Mfg. Co., Div. Pneumatic Scale Corp., Quincy, Mass.
•Colton, Arthur, Co., Detroit
Delamere & Williams Co., Toronto, Ont.
Geveke & Co., Elmsford, N. Y.
•Industrie-Werke Karlsruhe Aktiengesellschaft, Karlsruhe, Germany
•National Equipment Corp., New York
Perl Machine Mfg. Co., Brooklyn, N. Y.
•Production Equipment, Inc., Div. Burnet Co., Paramus, N. J.
Roberts Patent Filling Machine Co., Bolton, Lancs., England
Saga Packaging Machinery Div., A & M Tool & Die Co., Southbridge, Mass.
•Sanford, William B., Inc., New York

MACHINES, COLLAPSIBLE TUBE LACQUERING, VARNISHING & PRINTING

Editorial information, Div. IV Sec. 15

•Apex Machine Co., College Point, N. Y.
Herlan, F., Machinery Corp., New York
•Index Industrial Corp., New York
International Eastern Co., New York
Moore, Kenneth J., & Co., Chicago
Pan Industrial Corp., New York
•Peerless Tube Co., Bloomfield, N. J.
Sun Chemical Corp., New York

MACHINES, COLLATING

Automation Engineering Laboratories, Inc., Stamford, Conn.
•Dexter Co., Div. Miehle-Goss-Dexter, Inc., Chicago
•Diederichs & Griffin Co., Chicago
Faustel, Inc., Butler, Wis.
Griswold Engineering Ltd., Montreal, Que.
Hamilton Tool Co., Hamilton, Ohio
Harris-Seybold Co., Div. Harris-Intertype Corp., Cleveland
Helix Machine Co., Hicksville, N. Y.
•Scandia Packaging Machinery Co., No. Arlington, N. J.
•Web Controls Corp., W. Englewood, N.J.
Western Gear Corp., Lynwood, Calif.

MACHINES, CORKING

Editorial information, Div. III Sec. 12

•Amaco, Inc., Chicago
•Horix Mfg. Co., Pittsburgh
•Perry Industries, Inc., Brooklyn, N. Y.
Roberts Patent Filling Machine Co., Bolton, Lancs., England
U. S. Bottlers Machinery Co., Chicago

MACHINES, COTTON INSERTING

Editorial information, Div. III Sec. 12

•Amaco, Inc., Chicago
Ampoule Machine Co., Long Island City, N. Y.
•Consolidated Packaging Machinery Corp., Buffalo, N. Y.
Hofliger & Karg, Waiblingen bei Stuttgart, Germany
•Lakso Co., Fitchburg, Mass.
•Production Equipment, Inc., Div. Burnet Co., Paramus, N. J.

MACHINES, COUPON INSERTING

•Amaco, Inc., Chicago
•Jones, R. A., & Co., Cincinnati
Thiele Packaging Machinery Co., Div. Stainless & Steel Products Co., St. Paul, Minn.
Weigh Right Automatic Scale Co., Joliet, Ill.

MACHINES, CUTTING

(Cellophane & Paper)

Editorial information, Div. III Sec. 14

•Beck, Charles, Machine Corp., King of Prussia, Pa.
Challenge Machinery Co., Grand Haven, Mich.
•Clark-Aiken Co., Lee, Mass.
Clavell Bate & Nephews Ltd., Nelson, Lancashire, England
•Conapac Corp., New York
Ex-Cell-O Corp., Ex-Cell-O-Staude Dept., Detroit
Faustel, Inc., Butler, Wis.
Globe Mfg. Co., Philadelphia
Harris-Seybold Co., Div. Harris-Intertype Corp., Cleveland
•Hobbs Mfg. Co., Worcester, Mass.
Ketchpel Engineering Co., W. Englewood, N. J.
•Lawson Co., Div. Miehle-Goss-Dexter, Inc., Chicago
•Lever Mfg. Co., New York
•MfP Div., Avery Industries, Inc., San Mateo, Calif.
Rockport Machine & Tool Co., Cleveland
•Royal Zenith Corp., New York
Smith & Winchester Mfg. Co., So. Windham, Conn.
Taylor, Stiles & Co., Riegelsville, N. J.
Thomson-National Press Co., Franklin, Mass.
•Web Controls Corp., W. Englewood, N. J.

MACHINES, DIE CUTTING

Editorial information, Div. III Sec. 14

•Abbott Plastic Machine Corp., Chicago
•Atlas Vac-Machine Corp., Rochester, N. Y.
Auto-Vac Co., Div. National Cleveland Corp., Fairfield, Conn.
•Champlain Co., Roseland, N. J.
Craftsmen Machinery Co., Boston
Ex-Cell-O Corp., Ex-Cell-O-Staude Dept., Detroit
Greggory, Inc., Chicago
Harco Industries, Inc., Rochester, N. Y.
Heidelberg Eastern, Inc., Glendale, N. Y.
•Hobbs Mfg. Co., Worcester, Mass.
•Lawson Co., Div. Miehle-Goss-Dexter, Inc., Chicago
•Mercury Engineering Corp., Sub. Miehle-Goss-Dexter, Inc., Milwaukee
Milwaukee Tool & Machine Co., Milwaukee
New Era Die Co., Red Lion, Pa.
Paper Machinery Corp., Milwaukee
Printing Machinery Co., Cincinnati
S & S Corrugated Paper Machinery Co., Brooklyn, N. Y.
Sohn Mfg., Inc., Elkhart Lake, Wis.
Thomson-National Press Co., Franklin, Mass.
•Tronomatic Corp., Bronx, N. Y.
•United Shoe Machinery Corp., Boston
Weber, H. G., & Co., Kiel, Wis.
West Engineering Co., Richmond, Va.

MACHINES, DOMING

(Boxes)

Editorial information, Div. III Sec. 14

•FMC Corp., Stokes & Smith Plant, Philadelphia
•Kensol-Olsenmark, Inc., New York
Woehr, F. A., Machine Corp., Rochester, N. Y.

MACHINES, EMBOSSING

Editorial information, Div. IV Sec. 15

•Ackerman Gould Co., Oceanside, N. Y.
Alclyde Engraving Co., Chatham, N. J.
•Appleton Machine Co., Appleton, Wis.
•Black-Clawson Co., Dilts Div., Fulton, N. Y.
•Champlain Co., Roseland, N. J.
Cornelius, Theodore, New York
Coughlin Mfg. Co., New York
Craftsmen Machinery Co., Boston
Dietz Machine Works, Inc., Philadelphia
Egan, Frank W., & Co., Somerville, N. J.
Elgin Mfg. Co., Elgin, Ill.
•FMC Corp., Hudson-Sharp Plant, Green Bay, Wis.
Heidelberg Eastern, Inc., Glendale, N. Y.
Helix Machine Co., Hicksville, N. Y.
•Index Industrial Corp., New York
•Inta-Roto Machine Co., Richmond, Va.
•Kensol-Olsenmark, Inc., New York
Lembo Machine Works, Inc., Paterson, N. J.
•Markem Machine Co., Keene, N. H.
•Modern Plastic Machinery Corp., Clifton, N. J.
Pannier Corp., Pittsburgh
Paper Converting Machine Co., Green Bay, Wis.
Perkins, B. F., & Son, Inc., Holyoke, Mass.
Shannon, Alexander J., Co., Fonda, N. Y.
Swan Machine Co., New York
•Tronomatic Corp., Bronx, N. Y.
Virkotype Corp., Plainfield, N. J.
•Waldron-Hartig Div., Midland-Ross Corp., New Brunswick, N. J.
•Web Controls Corp., W. Englewood, N.J.
•Weldotron Corp., Newark, N. J.

MACHINES, ENVELOPE MAKING

Editorial information, Div. III Sec. 14

•Conapac Corp., New York
Ex-Cell-O Corp., Ex-Cell-O-Staude Dept., Detroit
•International Paper Box Machine Co., Nashua, N. H.
Moore, Kenneth J., & Co., Chicago

MACHINES, FIBRE CAN MAKING

Editorial information, Div. III Sec. 14

Dietz Machine Works, Inc., Philadelphia
•Knowlton, M. D., Co., Rochester, N. Y.
•Packomatic Div., Textile Machine Works, Reading, Pa.
Paco Winders, Inc., Philadelphia
Rockport Machine & Tool Co., Cleveland

MACHINES, FILLING, BY COUNT

(See also Machines, Tablet Counting & Packaging)

Editorial information, Div. III Sec. 12

Aidlin Automation, Inc., Brooklyn, N. Y.
Automation Management, Inc., Westboro, Mass.
Autotron, Inc., Danville, Ill.

•Bartelt Engineering Co., Rockford, Ill.
Batchelder Engineering Co., Springfield, Vt.
Black Products Co., Chicago
•Brown Filling Machine Co., Sub. Sundstrand Corp., Ann Arbor, Mich.
•Bursak Packaging Machinery Corp., Jackson, Wis.
Count-O-Matic, Inc., Div. U. S. Engineering Co., Long Island City, N. Y.
Cozzoli Machine Co., Plainfield, N. J.
Delta Engineering Corp., Melrose, Mass.
•Diederichs & Griffin Co., Chicago
Fairchild's, Inc., Los Angeles
•Foils Packaging Corp., Cincinnati
Formvac, Zurich, Switzerland
General Packaging Equipment Co., Houston, Texas
Gilman Paper Co., New York
•Hayssen Mfg. Co., Sheboygan, Wis.
Hofliger & Karg, Waiblingen bei Stuttgart, Germany
Ideal Packagings Ltd., London, England
•Karstrom Co., Menomonee Falls, Wis.
•Lakso Co., Fitchburg, Mass.
•Mercury Heat Sealing Equipment Co., Philadelphia
Merrill Machinery Co., Chicago
Mettler Instrument Corp., Princeton, N. J.
•Pak-Rapid, Inc., W. Conshohocken, Pa.
•Production Equipment, Inc., Div. Burnet Co., Paramus, N. J.
Shaw, Frank, Co., Los Angeles
•U. S. Automatic Box Machinery Co., Boston

MACHINES, FILLING, DRY

A. Gross & Net Weight
B. Volumetric

Editorial information, Div. III Sec. 12

Allied Equipment Co., Yonkers, N. Y. (B)
•Amaco, Inc., Chicago (A, B)
•Amsco Packaging Machinery, Inc., Long Island City, N. Y. (A, B)
Andora Automation, Inc., Brooklyn, N. Y. (A)
Automatic Scale Co., New York (A, B)
Autopack Ltd., Malvern Link, Worcestershire, England (A, B)
•Bartelt Engineering Co., Rockford, Ill. (A, B)
•Battle Creek Packaging Machines, Inc., Battle Creek, Mich. (B)
Bemis Bro. Bag Co., St. Louis, Mo. (A, B)
Black Products Co., Chicago (A)
Brecknell, Dolman & Rogers Ltd., Bristol, England (A)
•Brown Filling Machine Co., Sub. Sundstrand Corp., Ann Arbor, Mich. (B)
•Bursak Packaging Machinery Corp., Jackson, Wis. (A, B)
Carter Engineering Co., Danville, Ill. (A)
Chase Equipment Co., Div. C. W. Logeman Co., Brooklyn, N. Y. (B)
Circle Design & Mfg. Corp., Emerson, N. J. (A, B)
•Clybourn Machine Corp., Chicago (A, B)
Coddington, E. D., Mfg. Co., Milwaukee (A, B)
•Consolidated Packaging Machinery Corp., Buffalo, N. Y. (A)
Delamere & Williams Co., Toronto, Ont. (A, B)
•Diederichs & Griffin Co., Chicago (A, B)
Exact Weight Scale Co., Columbus, Ohio (A)
Exactron, Inc., Dumont, N. J. (A)
•FMC Corp., Stokes & Smith Plant, Philadelphia (A, B)
•Foils Packaging Corp., Cincinnati (A, B)
Formvac, Zurich, Switzerland (A, B)
•Frazier & Son, Clifton, N. J. (B)
General Packaging Equipment Co., Houston, Texas (A, B)
Geveke & Co., Elmsford, N. Y. (A, B)
Gilman Paper Co., New York (A)
Glengarry Processes, Inc., Bay Shore, N. Y. (A)
•Gump, B. F., Co., Chicago (A)
Hannconn Machine Co., New York (A, B)
•Hayssen Mfg. Co., Sheboygan, Wis. (A, B)
•Hesser, Fr., Maschinenfabrik AG, Stuttgart-Bad Cannstatt, Germany (A, B)
Hofliger & Karg, Waiblingen bei Stuttgart, Germany (A, B)
Howe Scale Co., Rutland, Vt. (A)
Ideal Packagings Ltd., London, England (A, B)
•Karstrom Co., Menomonee Falls, Wis. (A, B)
Ketchpel Engineering Co., W. Englewood, N. J. (B)
•Lynch Corp., Anderson, Ind. (A, B)
Mateer, G. Diehl, Co., Wayne, Pa. (A, B)
•Mercury Heat Sealing Equipment Co., Philadelphia (A)
Mettler Instrument Corp., Princeton, N.J. (A)
Miller Wrapping & Sealing Machine Co., Chicago (A, B)
Nalbach, John R., Engineering Co., Chicago (B)
•National Instrument Co., Baltimore, Md. (A)
Olofsson Corp., Lansing, Mich. (A)
•Package Machinery Co., E. Longmeadow, Mass. (A, B)
•Packomatic Div., Textile Machine Works, Reading, Pa. (A, B)
•Pack-Rite Machines, Div. Techtmann Industries, Inc., Milwaukee (A)
•Pak-Rapid, Inc., W. Conshohocken, Pa. (A, B)
•Perry Industries, Inc., Brooklyn, N. Y. (B)
Plageman Enterprises, Inc., Cleveland (A, B)
•Pneumatic Scale Corp., Quincy, Mass. (A, B)
•Redington Div., Crompton & Knowles Packaging Corp., Bellwood, Ill. (A, B)
Richardson Scale Co., Clifton, N. J. (A)
St. Regis Paper Co., New York (A)
•Sanford, William B., Inc., New York (A, B)
Southall & Smith Ltd., Birmingham, England (A, B)
Stoker, H. L., Co., Claremont, Calif. (A)
Stuyvesant Engineering Corp., Norwood, N. J. (B)
Tanzi, Aurelio, Engineering Co., Brooklyn, N. Y. (B)
Thayer Scale Corp., Pembroke, Mass. (A)
•Trescott Co., Fairport, N. Y. (A)
•Triangle Package Machinery Co., Chicago (A, B)
•U. S. Automatic Box Machinery Co., Boston (A, B)
Weigh Right Automatic Scale Co., Joliet, Ill. (A, B)
•Wright Machinery Co., Div. Sperry Rand Corp., Durham, N. C. (A)
Wright Machinery Co., Colnbrook, Bucks., England (A)

MACHINES, FILLING, LIQUID & SEMI-LIQUID

A. Free-Flowing
B. Viscous

Editorial information, Div. III Sec. 12

•Aerosol Machinery Co., Westbury, N. Y. (A, B)
Allied Equipment Co., Yonkers, N. Y. (B)
•Amaco, Inc., Chicago (A, B)
Anderson Bros. Mfg. Co., Rockford, Ill. (B)
Andora Automation, Inc., Brooklyn, N. Y. (A, B)
•Arenco Machine Co., New York (A, B)
•Bartelt Engineering Co., Rockford, Ill. (A, B)
Baumann, Franz, & Co., Zurich, Switzerland (A)
Bell Machine Co., Oshkosh, Wis. (A)
Biner-Ellison Machinery Co., Los Angeles (A, B)
•Brown Filling Machine Co., Sub. Sundstrand Corp., Ann Arbor, Mich. (A, B)
•Bursak Packaging Machinery Corp., Jackson, Wis. (A, B)
Burt, F. L., Co., San Francisco (A, B)
Chase Equipment Co., Div. C. W. Logeman Co., Brooklyn, N. Y. (A, B)
•Chisholm-Ryder Co. of Pa., Hanover, Pa. (A)
Circle Design & Mfg. Corp., Emerson, N. J. (A, B)
•Colton, Arthur, Co., Detroit (A, B)
Cozzoli Machine Co., Plainfield, N. J. (A, B)
Crandall Can Filler Machine Co., Buffalo, N. Y. (A, B)
•Crown Cork & Seal Co., Philadelphia (A)
Dairy Whipt Div., Aerated Container Corp., Chicago (A, B)
Delamere & Williams Co., Toronto, Ont. (A)
•Diederichs & Griffin Co., Chicago (A, B)
Drum Equipment Corp., Union, N. J. (A, B)
•Economic Machinery Co., Worcester, Mass. (A, B)
Elgin Mfg. Co., Elgin, Ill. (A, B)
Emmer Glass Corp., Miami, Fla. (A)
•Ertel Engineering Corp., Kingston, N. Y. (A)
Exact Weight Scale Co., Columbus, Ohio (A)
Eyrle Co., San Francisco (A)
•FMC Corp., Canning Machinery Div., San Jose, Calif. (A, B)
•FMC Corp., Stokes & Smith Plant, Philadelphia (B)
Filler Machine Co., Philadelphia (A, B)
Filpaco Industries, Inc., Chicago (A, B)
•Foils Packaging Corp., Cincinnati (A, B)
Formvac, Zurich, Switzerland (A, B)
General Packaging Equipment Co., Houston, Texas (A)
Girdler Process Equipment Div., Chemetron Corp., Louisville, Ky. (A, B)
Glengarry Processes, Inc., Bay Shore, N. Y. (A, B)
Griswold Engineering Ltd., Montreal, Que. (A)
•Hayssen Mfg. Co., Sheboygan, Wis. (A B)
Hofliger & Karg, Waiblingen bei Stuttgart, Germany (A, B)
•Horix Mfg. Co., Pittsburgh (A, B)
Ideal Packagings Ltd., London, England (A, B)
Kahlenberg-Globe Equipment Co., Sarasota, Fla. (A)
•Kartridg Pak Co., Mount Prospect, Ill. (A)
Kiefer, Karl, Machine Co., Cincinnati (A, B)
Laub Engineering Co., San Gabriel, Calif. (A, B)
Lily-Tulip Cup Corp., New York (A, B)
•Lynch Corp., Anderson, Ind. (A)
•MRM Co., Plainview, N. Y. (A, B)
Mantes, T. R., Co., San Francisco (A, B)
Mateer, G. Diehl, Co., Wayne, Pa. (A, B)
•Mercury Heat Sealing Equipment Co., Philadelphia (A, B)
Meyer, Geo. J., Mfg. Co., Cudahy, Wis. (A)
Modern Packaging Machinery Co., Van Nuys, Calif. (A, B)
•Mojonnier, Albert, Inc., Franklin Park, Ill. (A)
•National Equipment Corp., New York (A)
•National Instrument Co., Baltimore, Md. (A, B)
•Package Machinery Co., E. Longmeadow, Mass. (A, B)
•Packer Machinery Corp., Brooklyn, N. Y. (A, B)

•Pak-Rapid, Inc., W. Conshohocken, Pa. (A, B)
Perl Machine Mfg. Co., Brooklyn, N. Y. (A, B)
Pfaudler Co., Div. Pfaudler Permutit, Inc., Rochester, N. Y. (B)
•Pneumatic Scale Corp., Quincy, Mass. (A)
Roberts Patent Filling Machine Co., Bolton, Lancs., England (A, B)
Robins Engineering Co., No. Haven, Conn. (A, B)
Saga Packaging Machinery Div., A & M Tool & Die Co., Southbridge, Mass. (A, B)
•Sanford, William B., Inc., New York (A, B)
Scientific Filter Co., New York (A, B)
Sealright Co., Fulton, N. Y. (A)
•Triangle Package Machinery Co., Chicago (B)
U. S. Bottlers Machinery Co., Chicago (A, B)

MACHINES, FILLING, NON-FREE-FLOWING SOLIDS

Editorial information, Div. III Sec. 12

•Amaco, Inc., Chicago
•Amsco Packaging Machinery, Inc., Long Island City, N. Y.
•Arenco Machine Co., New York
•Bartelt Engineering Co., Rockford, Ill.
•Brown Filling Machine Co., Sub. Sundstrand Corp., Ann Arbor, Mich.
Circle Design & Mfg. Corp., Emerson, N. J.
•Colton, Arthur, Co., Detroit
Delamere & Williams Co., Toronto, Ont.
Delta Engineering Corp., Melrose, Mass.
•Diederichs & Griffin Co., Chicago
•FMC Corp., Stokes & Smith Plant, Philadelphia
•Foils Packaging Corp., Cincinnati
Formvac, Zurich, Switzerland
Geveke & Co., Elmsford, N. Y.
•Gump, B. F., Co., Chicago
•Karstrom Co., Menomonee Falls, Wis.
Ketchpel Engineering Co., W. Englewood, N. J.
Kliklok, Automated Packaging Div., Atlas General Industries, Inc., New York
•Lynch Corp., Anderson, Ind.
•National Equipment Corp., New York
•National Instrument Co., Baltimore, Md.
•Packomatic Div., Textile Machine Works, Reading, Pa.
•Pack-Rite Machines, Div. Techtmann Industries, Inc., Milwaukee
•Pak-Rapid, Inc., W. Conshohocken, Pa.
•Perry Industries, Inc., Brooklyn, N. Y.
Pfaudler Co., Div. Pfaudler Permutit, Inc., Rochester, N. Y.
•Quickpak Machinery Corp., Culver City, Calif.
Rex Packaging Machine Co., Rahway, N. J.
Saga Packaging Machinery Div., A & M Tool & Die Co., Southbridge, Mass.
St. Regis Paper Co., New York
Stoker, H. L., Co., Claremont, Calif.
•U. S. Automatic Box Machinery Co., Boston

MACHINES, FILM EXTRUDING

Editorial information, Div. III Sec. 14

American Products Mfg. Co., New Orleans, La.
•Black-Clawson Co., Hale & Kullgren Plastics Dept., Akron, Ohio
Egan, Frank W., & Co., Somerville, N. J.
•Hartig Extruders, Waldron-Hartig Div., Midland-Ross Corp., Westfield, N. J.
•Hobbs Mfg. Co., Worcester, Mass.
•Modern Plastic Machinery Corp., Clifton, N. J.
National Rubber Machinery Co., Akron, Ohio
Prodex Corp., Fords, N. J.
Royle, John, & Sons, Paterson, N. J.
Sterling Extruder Corp., Linden, N. J.
Thermoplastic Processes, Inc., Stirling, N. J.
Wilmod Machinery Co., Toronto, Ont.

MACHINES, FILM TREATING

(For Printing)

Aetna Electronics Corp., No. Branch, N.J.
Mancib, Alvin S., Co., Cambridge, Mass.
•Modern Plastic Machinery Corp., Clifton, N. J.

MACHINES, FILTER

Editorial information, Div. III Sec. 12

Delamere & Williams Co., Toronto, Ont.
•Ertel Engineering Corp., Kingston, N. Y.
Filpaco Industries, Inc., Chicago
Kiefer, Karl, Machine Co., Cincinnati
Scientific Filter Co., New York

MACHINES, GLUING

Editorial information, Div. III Sec. 14

•Black-Clawson Co., Dilts Div., Fulton, N. Y.
Cooper, D. C., Co., Chicago
Cozzoli Machine Co., Plainfield, N. J.
Crowe Engineering Co., Cincinnati
•Diederichs & Griffin Co., Chicago
•Doughboy Industries, Inc., New Richmond, Wis.
•Embart Mfg. Co., Portland Div., Portland, Conn.
Emmer Glass Corp., Miami, Fla.
Ex-Cell-O Corp., Ex-Cell-O-Staude Dept., Detroit
•FMC Corp., Stokes & Smith Plant, Philadelphia
•Foils Packaging Corp., Cincinnati
•Fry, George H., Co., Mineola, N. Y.
Globe Mfg. Co., Philadelphia
Glue-Fast Equipment Co., New York
Ideal Packagings Ltd., London, England
Ketchpel Engineering Co., W. Englewood, N. J.
Kliklok, Automated Packaging Div., Atlas General Industries, Inc., New York
Lerner Machine Co., Ponders End, Middx., England
•Lynch Corp., Anderson, Ind.
Mayflower Electronic Devices, Inc., Little Ferry, N. J.
Moore, Kenneth J., & Co., Chicago
Package Forming Machinery Co., Toronto, Ont.
•Packomatic Div., Textile Machine Works, Reading, Pa.
Paper Machinery Corp., Milwaukee
•Peters Machinery Co., Chicago
Potdevin Machinery Co., Teterboro, N. J.
Renka Bagmachines Establishment, Amterdam, Holland
Rex Packaging Machine Co., Rahway, N. J.
Rockport Machine & Tool Co., Cleveland
Schaefer Machine Co., Bridgeport, Conn.
Scientific Filter Co., New York
Speedways Conveyors, Inc., Buffalo, N.Y.
Standard Paper Box Machine Co., New York
Union Bag-Camp Paper Corp., New York
•United Shoe Machinery Corp., Boston
Universal Corrugated Box Machinery Corp., Linden, N. J.
Weigh Right Automatic Scale Co., Joliet, Ill.
•Weldotron Corp., Newark, N. J.

MACHINES, HEAT SEALING

A. Band Type
B. Belt Type
C. Electronic
D. Impulse
E. Jaw Type
F. Rotary Type
G. Ultrasonic Welder

(See also Heat Sealers)

Editorial information, Div. III Sec. 12

Accurate Steel Rule Die Manufacturers, New York (C)
Aetna Electronics Corp., No. Branch, N.J. (G)
American Paper Box Co., Montreal, Que. (D, E)
American Thermoform Corp., Culver City, Calif. (E)
•Amsco Packaging Machinery, Inc., Long Island City, N. Y. (B, C, E, F)
•Arenco Machine Co., New York (E)
•Atlas Vac-Machine Corp., Rochester, N.Y. (D, E)
Bag-O-Matic Packaging Equipment Co., Los Angeles (A, D, E)
Bemis Bro. Bag Co., St. Louis, Mo. (E)
•Brown Filling Machine Co., Sub. Sundstrand Corp., Ann Arbor, Mich. (E)
Callanan, J. A., Co., Chicago (C, E)
•Carbert Mfg. Co., Div. Pneumatic Scale Corp., Quincy, Mass. (A)
Chaffee, Ralph, & Co., San Francisco (A)
Circle Design & Mfg. Corp., Emerson, N. J. (F)
•Clamco Div., Cleveland-Detroit Corp., Cleveland (C, D, E)
•Diederichs & Griffin Co., Chicago (A, B, C, D, E, F, G)
•Doughboy Industries, Inc., New Richmond, Wis. (A, E, F)
Dove, J. B., & Sons, Inc., Bristol, Pa. (E)
Dura-Lee Corp., Kansas City, Kan. (E)
•Erdco Engineering Corp., Addison, Ill. (C, F)
•Errich International Corp., New York (E)
•FMC Corp., Simplex Plant, Oakland, Calif. (E)
•Foils Packaging Corp., Cincinnati (D, F)
Formvac, Zurich, Switzerland (C, D)
France Engineering Co., Cleveland (E)
•Fry, George H., Co., Mineola, N. Y. (B)
Great Lakes Stamp & Mfg. Co., Chicago (B, D, E, F)
Griswold Engineering Ltd., Montreal, Que. (D, E)
•Hayssen Mfg. Co., Sheboygan, Wis. (D, E, F)
Heat Sealing Equipment Mfg. Co., Cleveland (E)
•Horix Mfg. Co., Pittsburgh (C, F)
Ideal Packagings Ltd., London, England (A, B, F)
International Banding Machine Div., Consolidated Lithographing Corp., Carle Place, N. Y. (A)
International Ultrasonics, Inc., Cranford, N. J. (G)
Kabar Mfg. Corp., Roosevelt, N. Y. (B, C, E)
Kalle A. G., Wiesbaden, Germany (E)
•Karstrom Co., Menomonee Falls, Wis. (A, E, F)
Mankato Paper Box Co., Mankato, Minn. (B)

Mayflower Electronic Devices, Inc., Little Ferry, N. J. (B, C, F, G)
McDougall Control Co., Seattle, Wash. (A)
•Mehl Mfg. Co., Cincinnati (E)
•Mercury Heat Sealing Equipment Co., Philadelphia (D, E)
Miller Wrapping & Sealing Machine Co., Chicago (E, F)
Modern Packaging Machinery Co., Van Nuys, Calif. (E)
•Mojonnier, Albert, Inc., Franklin Park, Ill. (E, F)
•National Equipment Corp., New York (A)
New Jersey Electronic Co., Passaic, N. J. (C, D)
•Packaging Industries Ltd., Montclair, N. J. (A, D, E)
Packaging Laboratories & Designing Ltd., Montreal, Que. (C, D, E)
•Pack-Rite Machines, Div. Techtmann Industries, Inc., Milwaukee (B, E, F)
Pan-O-Ramic Package Co., Janesville, Wis. (E, F)
•Peters Machinery Co., Chicago (E)
Plastic Welding Corp., Newark, N. J. (C, D)
Progressive Electronics Co., Passaic, N. J. (B, C, D, F)
•Protective Lining Corp., Brooklyn, N. Y. (E)
•Queen Transparent Specialties Co., Chicago (D, E)
•Quickpak Machinery Corp., Culver City, Calif. (E)
Reeve Electronics, Inc., Chicago (C, E)
Renka Bagmachines Establishment, Amsterdam, Holland (D)
Saga Packaging Machinery Div., A & M Tool & Die Co., Southbridge, Mass. (E)
•Sanford, William B., Inc., New York (A, E, F)
Schieldahl, G. T., Co., Northfield, Minn. (E)
Sealaround Corp., Chicago (E)
•Sealomatic Electronics Corp., New York (C, E, G)
Shannon, Alexander J., Co., Fonda, N. Y. (F)
•Sundstrand-American Broach, Div. Sundstrand Corp., Ann Arbor, Mich. (F)
Tempo-Vane Mfg. Co., San Francisco (B)
Thermatron Co., Div. Willcox & Gibbs, New York (C, E, F)
•Thermo Heat-Sealing Machine Co., New York (B, C, D, E, F)
Thiele Packaging Machinery Co., Div. Stainless & Steel Products Co., St. Paul, Minn. (C)
•Tronomatic Machine Mfg. Corp., New York (C, D, E, F)
•Ultra Sonic Seal, Inc., Div. Kleer-Vu Industries, Inc., New York (G)
Union Bag-Camp Paper Corp., New York (E)
•Vertrod Corp., Brooklyn, N. Y. (D, E)
Weber, H. G., & Co., Kiel, Wis. (E, F)
•Weldotron Corp., Newark, N. J. (C, D, E)
Wells Commercial Sales Co., So. San Francisco, Calif. (F)
•Wirth Rhodes Corp., Chicago (B, C, G)
Woodman Co., Decatur, Ga. (F)
•Wrap-Ade Machine Co., Clifton, N. J. (E)
Wright Machinery Co., Colnbrook, Bucks., England (E)

MACHINES, HINGE & CATCH ATTACHING

Aidlin Automation, Inc., Brooklyn, N. Y.
Geissel Mfg. Co., Hillside, N. J.

MACHINES, HOODING

Editorial information, Div. III Sec. 12

•Ekco-Alcoa Containers, Inc., Wheeling, Ill.
Sealright Co., Fulton, N. Y.
Standard Cap & Seal, Inc., Chamblee, Ga.

MACHINES, INJECTION MOLDING

Editorial information, Div. II Sec. 8, Div. III Sec. 14

•Conapac Corp., New York
Crown Machine & Tool Co., Fort Worth, Texas
Delamere & Williams Co., Toronto, Ont.
Farrel-Birmingham Co., Watson-Stillman Press Div., Rochester, N. Y.
Fellows Gear Shaper Co., Springfield, Vt.
H-P-M Div., Koehring Co., Mount Gilead, Ohio
•Index Industrial Corp., New York
Newbury Industries, Inc., Newbury, Ohio
•Package Machinery Co., E. Longmeadow, Mass.
Standard Tool Co., Leominster, Mass.
Stokes, F. J., Corp., Philadelphia

MACHINES, LABEL DISPENSING

Editorial information, Div. III Sec. 12

•Allen Hollander Co., New York
•American Tag Co., Belleville, N. J.
Applicon Machines, Cleveland
Avery Label Co., Div. Avery Adhesive Products, Inc., Monrovia, Calif.
Better Packages, Inc., Shelton, Conn.
•Carbert Mfg. Co., Div. Pneumatic Scale Corp., Quincy, Mass.
•Dennison Mfg. Co., Framingham, Mass.
Derby Sealers Div., Minnesota Mining & Mfg. Co., Derby, Conn.
Gummed Tape & Devices Co., Jersey City, N. J.
Hummel, A. C., Co., Cincinnati
Ideal Packagings Ltd., London, England
Ketchpel Engineering Co., W. Englewood, N. J.
•Lakso Co., Fitchburg, Mass.
Linear Products, Inc., New York
Minnesota Mining & Mfg. Co., St. Paul, Minn.
•Monarch Marking System Co., Dayton, Ohio
•Nashua Corp., Nashua, N. H.
•National Tag Co., Dayton, Ohio
•New Jersey Machine Corp., Hoboken, N. J.
Newman Labelling Machines Ltd., Barnet, Herts., England
Scientific Filter Co., New York
Technical Tape Corp., New Rochelle, N. Y.
Weber Marking Systems, Inc., Mount Prospect, Ill.
•Wrap-King Div., Crompton & Knowles Packaging Corp., Agawam, Mass.

MACHINES, LABEL INSPECTION

•Illumitronic Systems Corp., Sunnyvale, Calif.

MACHINES, LABELING

Editorial information, Div. III Sec. 12

•Amaco, Inc., Chicago
•Amsco Packaging Machinery, Inc., Long Island City, N. Y.
Anodyne, Inc., No. Miami Beach, Fla.
Atlas Labeling Machine Corp., Long Island City, N. Y.
Avery Label Co., Div. Avery Adhesive Products, Inc., Monrovia, Calif.
Ayers & Grimshaw Ltd., Barnstaple, Devon, England
Barraclough, R. W., Ltd., Southport, Lancashire, England
Barry-Wehmiller Machinery Co., St. Louis, Mo.
Baumann, Franz, & Co., Zurich, Switzerland
Biner-Ellison Machinery Co., Los Angeles
Brady, W. H., Co., Milwaukee
•Carbert Mfg. Co., Div. Pneumatic Scale Corp., Quincy, Mass.
•Chisholm-Ryder Co. of Pa., Hanover, Pa.
Derby Sealers Div., Minnesota Mining & Mfg. Co., Derby, Conn.
•Diederichs & Griffin Co., Chicago
•Doughboy Industries, Inc., New Richmond, Wis.
•Economic Machinery Co., Worcester, Mass.
Elliott Mfg. Co., Fresno, Calif.
•Emhart Mfg. Co., Portland Div., Portland, Conn.
Eureka Specialty Printing Co., Scranton, Pa.
•FMC Corp., Canning Machinery Div., San Jose, Calif.
Faustel, Inc., Butler, Wis.
Gisholt Machine Co., Madison, Wis.
Glue-Fast Equipment Co., New York
Great Lakes Stamp & Mfg. Co., Chicago
Hummel, A. C., Co., Cincinnati
Ideal Packagings Ltd., London, England
•Karstrom Co., Menomonee Falls, Wis.
Ketchpel Engineering Co., W. Englewood, N. J.
Kimball, A., Co., Brooklyn, N. Y.
Kleen-Stik Products, Inc., Chicago
•Labelette Co., Chicago
Long & Co., Baltimore, Md.
•MRM Co., Plainview, N. Y.
•Mercury Heat Sealing Equipment Co., Philadelphia
Meyer, Geo. J., Mfg. Co., Cudahy, Wis.
Miller Wrapping & Sealing Machine Co., Chicago
Minnesota Mining & Mfg. Co., St. Paul, Minn.
•Monarch Marking System Co., Dayton, Ohio
Moore, Kenneth J., & Co., Chicago
•New Jersey Machine Corp., Hoboken, N. J.
Newman Labelling Machines Ltd., Barnet, Herts., England
•Oliver Machinery Co., Grand Rapids, Mich.
•Package Machinery Co., E. Longmeadow, Mass.
•Pneumatic Scale Corp., Quincy, Mass.
Potdevin Machine Co., Teterboro, N. J.
•Sanford, William B., Inc., New York
Scientific Filter Co., New York
Soabar Co., Philadelphia
Thermatron Co., Div. Willcox & Gibbs, New York
Weber Marking Systems, Inc., Mount Prospect, Ill.
•Wrap-King Div., Crompton & Knowles Packaging Corp., Agawam, Mass.

MACHINES, LABELING ATTACHMENTS

Editorial information, Div. III Sec. 12

American Machine & Foundry Co., New York
•Amsco Packaging Machinery, Inc., Long Island City, N. Y.
Ayers & Grimshaw Ltd., Barnstaple, Devon, England
•Battle Creek Packaging Machines, Inc., Battle Creek, Mich.

Addresses of companies listed appear on pp. 808-847

•Carbert Mfg. Co., Div. Pneumatic Scale Corp., Quincy, Mass.
•Hayssen Mfg. Co., Sheboygan, Wis.
Hummel, A. C., Co., Cincinnati
Ideal Packagings Ltd., London, England
Ketchpel Engineering Co., W. Englewood, N. J.
Linear Products, Inc., New York
Milwaukee Tool & Machine Co., Milwaukee
Moore, Kenneth J., & Co., Chicago
•New Jersey Machine Corp., Hoboken, N. J.
•Oliver Machinery Co., Grand Rapids, Mich.
Thermatron Co., Div. Willcox & Gibbs, New York
Weber Marking Systems, Inc., Mount Prospect, Ill.
•Wrap-King Div., Crompton & Knowles Packaging Corp., Agawam, Mass.

MACHINES, LAMINATING

Editorial information, Div. III Sec. 14

Andre Paper Box Co., San Leandro, Calif.
•Black-Clawson Co., Dilts Div., Fulton, N. Y.
•Champlain Co., Roseland, N. J.
•Dexter Co., Div. Miehle-Goss-Dexter, Inc., Chicago
•Dusenbery, John, Co., Clifton, N. J.
Egan, Frank W., & Co., Somerville, N. J.
•FMC Corp., Hudson-Sharp Plant, Green Bay, Wis.
Farrel-Birmingham Co., Watson-Stillman Press Div., Rochester, N. Y.
Faustel, Inc., Butler, Wis.
Globe Mfg. Co., Philadelphia
Harco Industries, Inc., Rochester, N. Y.
Helix Machine Co., Hicksville, N. Y.
•Index Industrial Corp., New York
•Inta-Roto Machine Co., Richmond, Va.
Kohler Coating Machinery Corp., Middletown, Ohio
Lembo Machine Works, Inc., Paterson, N. J.
Mecca Machinery Co., Long Island City, N. Y.
•Mercury Engineering Corp., Sub. Miehle-Goss-Dexter, Inc., Milwaukee
•Modern Plastic Machinery Corp., Clifton, N. J.
Moore, Kenneth J., & Co., Chicago
Pacific Plastic Machinery, Inc., Chicago
Pan Industrial Corp., New York
Paper Converting Machine Co., Green Bay, Wis.
Potdevin Machine Co., Teterboro, N. J.
Prodex Corp., Fords, N. J.
Protexall Permanent Process Service, Kansas City, Mo.
Shannon, Alexander J., Co., Fonda, N. Y.
Sterling Extruder Corp., Linden, N. J.
Virginia Laminating Co., Amelia, Va.
•Waldron-Hartig Div., Midland-Ross Corp., New Brunswick, N. J.
•Web Controls Corp., W. Englewood, N. J.

MACHINES, MARKING

(Box & Carton)

Editorial information, Div. III Sec. 13

Acro Tool & Die Works, Chicago
•American Tag Co., Belleville, N. J.
•Apex Machine Co., College Point, N. Y.
Automatic Marking Equipment, New York
Barry-Wehmiller Machinery Co., St. Louis, Mo.
Bayberry Products Corp., Stamford, Conn.
•Bell-Mark Corp., Bloomfield, N. J.
•Chisholm-Ryder Co. of Pa., Hanover, Pa.
Colt Packaging Machinery Co., Cranston, R. I.
Coughlin Mfg. Co., New York
Cozzone Marking Co., Newark, N. J.
Diagraph-Bradley Industries, Inc., Herrin, Ill.
Elliott Mfg. Co., Fresno, Calif.
•Emhart Mfg. Co., Portland Div., Portland, Conn.
•Foils Packaging Corp., Cincinnati
Force Western, Inc., Chicago
Force, Wm. A., & Co., Brooklyn, N. Y.
•Gottscho, Adolph, Inc., Hillside, N. J.
•Harley, E. L., Inc., Brooklyn, N. Y.
•Industrial Marking Equipment Co., Brooklyn, N. Y.
International Eastern Co., New York
•Kensol-Olsenmark, Inc., New York
Kiwi Coders Corp., Chicago
•Markem Machine Co., Keene, N. H.
Matthews, Jas. H., & Co., Pittsburgh
Melind, Louis, Co., Chicago
Milwaukee Tool & Machine Co., Milwaukee
Muskegon Marking Equipment Co., Packaging Supplies Div., Muskegon, Mich.
•Packomatic Div., Textile Machine Works, Reading, Pa.
Pannier Corp., Pittsburgh
Pierce Wrapping Machine Co., La Grange Park, Ill.
Pitney-Bowes, Inc., Stamford, Conn.
Pryor Marking Products, Chicago
Soabar Co., Philadelphia
Thomas Engineering Co., Skokie, Ill.
Van Buskirk & Co., Bridgeport, Conn.
Verner, B., & Co., New York
Weber Marking Systems, Inc., Mount Prospect, Ill.

MACHINES, METAL EDGE STAYING

Editorial information, Div. III Sec. 14

American Paper Box Co., Montreal, Que.
•Cincinnati Box & Partition Co., Cincinnati
Metal Edge Industries, Barrington, N. J.
Standard Paper Box Machine Co., New York

MACHINES, MOUNTING & PROVING

A. Rotogravure
B. Rubber Printing Plates

Editorial information, Div. III Sec. 14, Div. IV Sec. 15

•Conapac Corp., New York (B)
•Harley, E. L., Inc., Brooklyn, N. Y. (B)
Matthews, Jas. H., & Co., Pittsburgh (B)
Monomelt Co., Minneapolis (B)
Mosstype Corp., Waldwick, N. J. (B)
•Williamson & Co., Caldwell, N. J. (B)

MACHINES, PAPER CONTAINER MAKING

(Liquid-Tight Rigid)

Editorial information, Div. III Sec. 14

Ams, Max, Machine Co., Bridgeport, Conn.
•Diederichs & Griffin Co., Chicago
Dietz Machine Works, Inc., Philadelphia
•Foils Packaging Corp., Cincinnati
Package Forming Machinery Co., Toronto, Ont.
Paper Machinery Corp., Milwaukee
S & S Corrugated Paper Machinery Co., Brooklyn, N. Y.

MACHINES, PAPER ROLL FEEDING

Editorial information, Div. III Sec. 13, 14

•Appleton Machine Co., Appleton, Wis.
Ayers & Grimshaw Ltd., Barnstaple, Devon, England
•Beck, Charles, Machine Corp., King of Prussia, Pa.
•Black-Clawson Co., Dilts Div., Fulton, N. Y.
•Champlain Co., Roseland, N. J.
•Clark-Aiken Co., Lee, Mass.
•Diederichs & Griffin Co., Chicago
Egan, Frank W., & Co., Somerville, N. J.
Harris-Seybold Co., Div. Harris-Intertype Corp., Cleveland
Johnstone Engineering & Machine Co., Parkesburg, Pa.
Kohler Coating Machinery Corp., Greentown, Ohio
Milwaukee Tool & Machine Co., Milwaukee
St. Regis Paper Co., New York
Stanford Engineering Co., Salem, Ill.

MACHINES, PAPER SHREDDING

East Chicago Machine Tool Corp., East Chicago, Ind.
Industrial Shredder & Cutter Co., Salem, Ohio
Lee & Henry Mfg. Co., San Francisco
Shredmaster Corp., Freeport, N. Y.
Taylor, Stiles & Co., Riegelsville, N. J.

MACHINES, PARTITION ASSEMBLING

Huntingdon Industries, Inc., Bethayres, Pa.
Liberty Engineering Co., Beloit, Wis.
Milwaukee Tool & Machine Co., Milwaukee

MACHINES, PARTITION SLOTTING

(Corrugated & Chip Board)

Ex-Cell-O Corp., Ex-Cell-O-Staude Dept., Detroit
Liberty Engineering Co., Beloit, Wis.
Milwaukee Tool & Machine Co., Milwaukee
S & S Corrugated Paper Machinery Co., Brooklyn, N. Y.
Universal Corrugated Box Machinery Corp., Linden, N. J.

MACHINES, REVENUE STAMP APPLYING

Editorial information, Div. III Sec. 12

Faustel, Inc., Butler, Wis.
Molins Machine Co., Richmond, Va.
•Scandia Packaging Machinery Co., No. Arlington, N. J.
•Wright Machinery Co., Div. Sperry Rand Corp., Durham, N. C.

MACHINES, RIGID TRANSPARENT FABRICATING

Editorial information, Div. III Sec. 14

American Tool Works Co., Cincinnati
Ex-Cell-O Corp., Ex-Cell-O-Staude Dept., Detroit
•FMC Corp., Stokes & Smith Plant, Philadelphia
•Taber Instrument Corp., No. Tonawanda, N. Y.
•Tronomatic Corp., Bronx, N. Y.

MACHINES, ROLL LEAF STAMPING

Editorial information, Div. IV Sec. 15

•Ackerman Gould Co., Oceanside, N. Y.
Admiral Coated Products, Inc., Hackensack, N. J.
Altair Machinery Corp., New York
•Apex Machine Co., College Point, N. Y.
•Bell-Mark Corp., Bloomfield, N. J.
Coughlin Mfg. Co., New York
•Diederichs & Griffin Co., Chicago
•Gottscho, Adolph, Inc., Hillside, N. J.
•Industrial Marking Equipment Co., Brooklyn, N. Y.
•Kensol-Olsenmark, Inc., New York
•Markem Machine Co., Keene, N. H.
Marking Products Ltd., Montreal, Que.
Matthews, Jas. H., & Co., Pittsburgh
Monomelt Co., Minneapolis
•Peerless Roll Leaf Co., Div. Howe Sound Co., Union City, N. J.
Swan Machine Co., New York

MACHINES, RUBBER PLATE MAKING

Editorial information, Div. IV Sec. 15

American Evatype Corp., Deerfield, Ill.
•Apex Machine Co., College Point, N. Y.
Craftsmen Machinery Co., Boston
Melind, Louis, Co., Chicago
•Williamson & Co., Caldwell, N. J.

MACHINES, SCORING

Editorial information, Div. III Sec. 14

•Abbott Plastic Machine Corp., Chicago
Colt Packaging Machinery Co., Cranston, R. I.
•Knowlton, M. D., Co., Rochester, N. Y.
•Manhasset Machine Co., Amityville, N. Y.
Rockport Machine & Tool Co., Cleveland
S & S Corrugated Paper Machinery Co., Brooklyn, N. Y.
Standard Paper Box Machine Co., New York
Thomson-National Press Co., Franklin, Mass.
Vickers-Armstrongs (Engineers) Ltd., London, England

MACHINES, SEALING, COLLAPSIBLE PLASTIC TUBES

Editorial information, Div. III Sec. 12

•Arenco Machine Co., New York
•Carbert Mfg. Co., Div. Pneumatic Scale Corp., Quincy, Mass.
•Colton, Arthur, Co., Detroit
Delamere & Williams Co., Toronto, Ont.
Kabar Mfg. Corp., Roosevelt, N. Y.
Liberty Engineering Co., Beloit, Wis.
•National Equipment Corp., New York
Reeve Electronics, Inc., Chicago
Saga Packaging Machinery Div., A & M Tool & Die Co., Southbridge, Mass.
•Sanford, William B., Inc., New York
Thermatron Co., Div. Willcox & Gibbs, New York

MACHINES, SHEET FEEDING

Editorial information, Div. III Sec. 14

•Appleton Machine Co., Appleton, Wis.
•Dexter Co., Div. Miehle-Goss-Dexter, Inc., Chicago
•Diederichs & Griffin Co., Chicago
Great Lakes Stamp & Mfg. Co., Chicago
Ketchpel Engineering Co., W. Englewood, N. J.
Verner, B., & Co., New York

MACHINES, SHEETING

Editorial information, Div. III Sec. 14

•Amsco Packaging Machinery, Inc., Long Island City, N. Y.
•Atlas Vac-Machine Corp., Rochester, N. Y.
•Beck, Charles, Machine Corp., King of Prussia, Pa.
•Champlain Co., Roseland, N. J.
•Clark-Aiken Co., Lee, Mass.
•Conapac Corp., New York
•FMC Corp., Hudson-Sharp Plant, Green Bay, Wis.
Faustel, Inc., Butler, Wis.
Globe Mfg. Co., Philadelphia
Greggory, Inc., Chicago
•Hobbs Mfg. Co., Worcester, Mass.
•Inta-Roto Machine Co., Richmond, Va.
Maxson Automatic Machinery Co., Westerly, R. I.
•Mercury Engineering Corp., Sub. Miehle-Goss-Dexter, Inc., Milwaukee
Miller Wrapping & Sealing Machine Co., Chicago
National Rubber Machinery Co., Akron, Ohio
•Peters Machinery Co., Chicago
Smith & Winchester Mfg. Co., So. Windham, Conn.
•Web Controls Corp., W. Englewood, N. J.

MACHINES, SLITTERS & REWINDERS

Editorial information, Div. III Sec. 14

•Appleton Machine Co., Appleton, Wis.
•Beck, Charles, Machine Corp., King of Prussia, Pa.
•Black-Clawson Co., Dilts Div., Fulton, N. Y.
•Cameron Machine Co., Dover, N. J.
•Champlain Co., Roseland, N. J.
Clavell Bate & Nephews Ltd., Nelson, Lancashire, England
Colt Packaging Machinery Co., Cranston, R. I.
•Conapac Corp., New York
Dietz Machine Works, Inc., Philadelphia
•Dusenbery, John, Co., Clifton, N. J.
Faustel, Inc., Butler, Wis.
Greggory, Inc., Chicago
H & W Machinery Corp., Richmond Hill, N. Y.
Helix Machine Co., Hicksville, N. Y.
•Hobbs Mfg. Co., Worcester, Mass.
•Inta-Roto Machine Co., Richmond, Va.
Johnstone Engineering & Machine Co., Parkesburg, Pa.
•Kidder Press Co., Dover, N. H.
•Knowlton, M. D., Co., Rochester, N. Y.
•Lever Mfg. Co., New York
•Manhasset Machine Co., Amityville, N. Y.
Mecca Machinery Co., Long Island City, N. Y.
•Mercury Engineering Corp., Sub. Miehle-Goss-Dexter, Inc., Milwaukee
S & S Corrugated Paper Machinery Co., Brooklyn, N. Y.
Schultz Engineering Corp., Brooklyn, N. Y.
Shannon, Alexander J., Co., Fonda, N. Y.
Standard Paper Box Machine Co., New York
Stanford Engineering Co., Salem, Ill.
•Web Controls Corp., W. Englewood, N. J.
Weber, H. G., & Co., Kiel, Wis.

MACHINES, SPIRAL WRAPPING

Editorial information, Div. III Sec. 12

Dietz Machine Works, Inc., Philadelphia
•Ludlow Corp., Needham Heights, Mass.
Pierce Wrapping Machine Co., La Grange Park, Ill.
Rockport Machine & Tool Co., Cleveland
Terkelsen Machine Co., Boston

MACHINES, SPOUT INSERTING

Editorial information, Div. III Sec. 14

Aidlin Automation, Inc., Brooklyn, N. Y.
Andora Automation, Inc., Brooklyn, N. Y.
Chase Equipment Co., Div. C. W. Logeman Co. Brooklyn, N. Y.
•PMC Industries, Hackensack, N. J.
•Packomatic Div., Textile Machine Works, Reading, Pa.
•Perry Industries, Inc., Brooklyn, N. Y.
Seal-Spout Corp., Mountainside, N. J.

MACHINES, STACKING

Editorial information, Div. III Sec. 12, 13

•FMC Corp., Stokes & Smith Plant, Philadelphia
Flexoveyor Mfg. Co., Denver, Colo.
Maxson Automatic Machinery Co., Westerly, R. I.
Milwaukee Tool & Machine Co., Milwaukee

MACHINES, STAPLING

Editorial information, Div. III Sec. 12, 13

Acme Staple Co., W. Franklin, N. H.
•Acme Steel Co., Chicago
Arrow Fastener Co., Brooklyn, N. Y.
Automation Fastening Co., Cleveland
Bates Mfg. Co., W. Orange, N. J.
•Bostitch, Inc., E. Greenwich, R. I.
General Staple Co., New York
Heller Roberts Instruments Corp., Cleveland
Ideal Stitcher Co., Div. W. R. Pabich Mfg. Co., Chicago
Inland Wire Products Co., Crawfordsville, Ind.
International Staple & Machine Co., Herrin, Ill.
Neva-Clog Products, Bridgeport, Conn.
Precision Staple Corp., Sarasota, Fla.
Staplex Co., Brooklyn, N. Y.
•Taber Instrument Corp., No. Tonawanda, N. Y.

MACHINES, STEEL RULE DIEMAKING

Automation Fastening Co., Cleveland
Helmold, J. E., & Bro., Inc., Chicago

MACHINES, SYRUPERS

Editorial information, Div. III Sec. 12

Chase Equipment Co., Div. C. W. Logeman Co., Brooklyn, N. Y.
•Chisholm-Ryder Co. of Pa., Hanover, Pa.
•Crown Cork & Seal Co., Philadelphia
•FMC Corp., Canning Machinery Div., San Jose, Calif.
•Horix Mfg. Co., Pittsburgh
Kiefer, Karl, Machine Co., Cincinnati

MACHINES, TABLET COUNTING & PACKAGING

Editorial information, Div. III Sec. 12

Aidlin Automation, Inc., Brooklyn, N. Y.
•Amaco, Inc., Chicago
Chase Equipment Co., Div. C. W. Logeman Co., Brooklyn, N. Y.
Circle Design & Mfg. Corp., Emerson, N. J.
•Colton, Arthur, Co., Detroit

Addresses of companies listed appear on pp. 808-847

Count-O-Matic, Inc., Div. U. S. Engineering Co., Long Island City, N. Y.
Cozzoli Machine Co., Plainfield, N. J.
Delta Engineering Corp., Melrose, Mass.
Exactron, Inc., Dumont, N. J.
•FMC Corp., Stokes & Smith Plant, Philadelphia
Fairchild's, Inc., Los Angeles
Formvac, Zurich, Switzerland
Ideal Packagings Ltd., London, England
•Industrie-Werke Karlsruhe Aktiengesellschaft, Karlsruhe, Germany
•Karstrom Co., Menomonee Falls, Wis.
•Lakso Co., Fitchburg, Mass.
•Mercury Heat Sealing Equipment Co., Philadelphia
Merrill Machinery Co., Chicago
Modern Packaging Machinery Co., Van Nuys, Calif.
•Pak-Rapid, Inc., W. Conshohocken, Pa.
•Production Equipment, Inc., Div. Burnet Co., Paramus, N. J.
•Redington Div., Crompton & Knowles Packaging Corp., Bellwood, Ill.
•Rondo of America, Hamden, Conn.
•Sundstrand-American Broach, Div. Sundstrand Corp., Ann Arbor, Mich.
•U. S. Automatic Box Machinery Co., Boston
Vol-Pak, Inc., New York

MACHINES, TABLET FORMING

Editorial information, Div. III Sec. 12

Brecknell, Dolman & Rogers Ltd., Bristol, England
•Colton, Arthur, Co., Detroit
•National Equipment Corp., New York
Stokes, F. J., Corp., Philadelphia

MACHINES, TAG STRINGING & WIRING

•Auer, J. F., Inc., Mamaroneck, N. Y.
•FMC Corp., Stokes & Smith Plant, Philadelphia
Graeber Stringing & Wiring Machine Co., Hawthorne, N. J.
National Bundle Tyer Co., Blissfield, Mich.
•New Era Mfg. Co., Hawthorne, N. J.

MACHINES, TAPE APPLYING, AUTOMATIC

A. Gummed
B. Heat Sealing
C. Pressure-Sensitive
D. Tear Strip

Editorial information, Div. III Sec. 12, 13

•Apex Machine Co., College Point, N. Y. (C, D)
Ayers & Grimshaw Ltd., Barnstaple, Devon, England (A, C, D)
Bemis Bro. Bag Co., St. Louis, Mo. (B, C)
Better Packages, Inc., Shelton, Conn. (C)
•Carbert Mfg. Co., Div. Pneumatic Scale Corp., Quincy, Mass. (B, C)
•Clybourn Machine Corp., Chicago (A)
Colt Packaging Machinery Co., Cranston, R. I. (A)
•Consolidated Packaging Machinery Corp., Buffalo, N. Y. (A, C)
Desmet, George W., Corp., Boston (C)
•Emhart Mfg. Co., Portland Div., Portland, Conn. (A)
•Errich International Corp., New York (A, C)
•General Corrugated Machinery Co., Palisades Park, N. J. (A, D)
Guide Co., Canfield, Ohio (C)
Gummed Tape & Devices Co., Jersey City, N. J. (A, C)
Habgood, Warren J., Co., Millbourne, Pa. (B, C)
•Hayssen Mfg. Co., Sheboygan, Wis. (A, B, D)
Kleen-Stik Products, Inc., Chicago (C)
Lathrop Paulson Co., Chicago (C)
Linear Products, Inc., New York (C)
Midway Machine Co., St. Paul, Minn. (C)
Milwaukee Tool & Machine Co., Milwaukee (A)
Minnesota Mining & Mfg. Co., St. Paul, Minn. (A, C, D)
•Package Machinery Co., E. Longmeadow, Mass. (D)
Possis Machine Corp., Minneapolis (C)
S & S Corrugated Paper Machinery Co., Brooklyn, N. Y. (A)
Soabar Co., Philadelphia (B)
Universal Corrugated Box Machinery Corp., Linden, N. J. (A)
Weber, H. G., & Co., Kiel, Wis. (C, D)
Wincanton Transport & Engineering Co., Sherborne, Dorset, England (C)

MACHINES, TAPE DISPENSERS

A. Gummed
B. Pressure-Sensitive
C. Printing Attachment

Editorial information, Div. III Sec. 13

Adhesive Tape Corp., Brooklyn, N. Y. (B)
Air Fixtures, Inc., No. Manchester, Ind. (A, B)
•Bell-Mark Corp., Bloomfield, N. J. (C)
Better Packages, Inc., Shelton, Conn. (A, B, C)
Brady, W. H., Co., Milwaukee (B)
•Clamco Div., Cleveland-Detroit Corp., Cleveland (B)
Derby Sealers Div., Minnesota Mining & Mfg. Co., Derby, Conn. (A, B, C)
Desmet, George W., Corp., Boston (B, C)
Devon Tape Corp., Mt. Vernon, N. Y. (B)
Diagraph-Bradley Industries, Inc., Herrin, Ill. (A, C)
Dickinson, John, & Co., Hemel Hempstead, Herts., England (A, B)
•Errich International Corp., New York (A, B)
•General Corrugated Machinery Co., Palisades Park, N. J. (A)
Gerrard, A. J., & Co., Des Plaines, Ill. (B)
Gummed Tape & Devices Co., Jersey City, N. J. (A, B, C)
Heat Sealing Equipment Mfg. Co., Cleveland (B)
Hummel, A. C., Co., Cincinnati (A, C)
Ideal Stencil Machine Co., Belleville, Ill. (A, C)
Kiwi Coders Corp., Chicago (C)
Linear Products, Inc., New York (B)
Marsh Stencil Machine Co., Belleville, Ill. (A)
Mid-States Gummed Paper Div., Minnesota Mining & Mfg. Co., Bedford Park, Ill. (A)
Midway Machine Co., St. Paul, Minn. (B)
Minnesota Mining & Mfg. Co., St. Paul, Minn. (A, B, C)
•Nashua Corp., Nashua, N. H. (A)
Nordisk Plaster Industri A/S, Copenhagen, Denmark (B)
•Pack-Rite Machines, Div. Techtmann Industries, Inc., Milwaukee (A)
Possis Machine Corp., Minneapolis (B)
Roll-On-Sealer Co., Antioch, Ill. (A)
Seal-O-Matic Dispenser Corp., Newark, N. J. (A, B, C)
Technical Tape Corp., New Rochelle, N. Y. (B)
Wincanton Transport & Engineering Co., Sherborne, Dorset, England (B)

MACHINES, TEA BAG

Editorial information, Div. III Sec. 12

Autopack Ltd., Malvern Link, Worcestershire, England
Delamere & Williams Co., Toronto, Ont.
•Diederichs & Griffin Co., Chicago
•FMC Corp., Stokes & Smith Plant, Philadelphia
Geveke & Co., Elmsford, N. Y.
Ideal Packagings Ltd., London, England
•Industrie-Werke Karlsruhe Aktiengesellschaft, Karlsruhe, Germany
Ketchpel Engineering Co., W. Englewood, N. J.
•Pneumatic Scale Corp., Quincy, Mass.
•Sanford, William B., Inc., New York
Teepack Spezialmaschinen G.m.b.H. & Co., Dusseldorf-Heerdt, Germany
Vol-Pak, Inc., New York

MACHINES, TEAR TAPE ATTACHING

Editorial information, Div. I Sec. 4

•Amaco, Inc., Chicago
Ayers & Grimshaw Ltd., Barnstaple, Devon, England
•Beck, Charles, Machine Corp., King of Prussia, Pa.
•General Corrugated Machinery Co., Palisades Park, N. J.
•Hayssen Mfg. Co., Sheboygan, Wis.
•Lynch Corp., Anderson, Ind.
Minnesota Mining & Mfg. Co., St. Paul, Minn.
•Redington Div., Crompton & Knowles Packaging Corp., Bellwood, Ill.
•Wrap-King Div., Crompton & Knowles Packaging Corp., Agawam, Mass.

MACHINES, THERMOFORMING

(For Plastic Sheet)

A. Blisters & Domes
B. Skin Packaging
C. Special Forms & Contours

Editorial information, Div. III Sec. 14

Abbott Eastern Machinery Sales Corp., New York (A, B, C)
•Abbott Plastic Machine Corp., Chicago (A, B, C)
American Thermoform Corp., Culver City, Calif. (A, B, C)
•Atlas Vac-Machine Corp., Rochester, N. Y. (A, B, C)
Auto-Vac Co., Div. National Cleveland Corp., Fairfield, Conn. (A, B, C)
Baumann, Franz, & Co., Zurich, Switzerland (C)
Borkland Laboratories, Marion, Ind. (A, B, C)
Brown Machine Co., Beaverton, Mich. (C)
•Champlain-Zapata Plastics Machinery Co., Caldwell, N. J. (C)
Cloud Machine Corp., Skokie, Ill. (A, C)
•Comet Industries, Franklin Park, Ill. (A, B, C)
•Conapac Corp., New York (A, B, C)
•Diederichs & Griffin Co., Chicago (A, B, C)
•Emhart Mfg. Co., Portland Div., Portland, Conn. (A, C)
•Erdco Engineering Corp., Addison, Ill. (A, C)
Formvac, Zurich, Switzerland (A, B, C)
Geveke & Co., Elmsford, N. Y. (A, B)

•Hamac-Hansella Maschinen GmbH, Dusseldorf, Germany (A, B, C)
•Index Industrial Corp., New York (A, B, C)
•Lassiter, Div. Riegel Paper Corp., New York (B)
•Lynch Corp., Anderson, Ind. (C)
•MfP Div., Avery Industries, Inc., San Mateo, Calif. (A, B, C)
Nevins Co., Clifton, N. J. (C)
Pacific Plastic Machinery, Inc., Chicago (A, B, C)
•Packaging Industries Ltd., Montclair, N. J. (A)
•Plast-O-Tron, Inc., Newark, N. J. (A, B, C)
Precision Products Co., Paterson, N. J. (A, B, C)
•Producto Machine Co., Bridgeport, Conn. (A)
•Riegel Paper Corp., New York (B)
Robins Engineering Co., No. Haven, Conn. (A)
•Sundstrand-American Broach Div., Sundstrand Corp., Ann Arbor, Mich. (A, C)
Thermatron Co., Div. Willcox & Gibbs, New York (C)
Thermomat Co., Trenton, N. J. (B)
•Trescott Co., Fairport, N. Y. (B)
•Tronomatic Corp., Bronx, N. Y. (A, B, C)
Wellington Associates, Phoenixville, Pa. (A, B, C)
Zack Radiant Heat Co., Passaic, N. J. (A, B, C)

MACHINES, TIGHT WRAPPING

(For Carton Shells)

Editorial information, Div. III Sec. 12

•Diederichs & Griffin Co., Chicago
Ideal Packagings Ltd., London, England
•Lynch Corp., Anderson, Ind.
•Pneumatic Scale Corp., Quincy, Mass.
•Trescott Co., Fairport, N. Y.

MACHINES, TUBE & CORE WINDING

A. Convolute
B. Spiral

Editorial information, Div. III Sec. 14

Baxter, J. C., Co., Minerva, Ohio (B)
•FMC Corp., Hudson-Sharp Plant, Green Bay, Wis. (B)
•Knowlton, M. D., Co., Rochester, N. Y. (A, B)
•Ludlow Corp., Needham Heights, Mass. (B)
•Packomatic Div., Textile Machine Works, Reading, Pa. (B)
Paco Winders, Inc., Philadelphia (A, B)
Rockport Machine & Tool Co., Cleveland (B)

MACHINES, TYING

Editorial information, Div. III Sec. 13, Div. V Sec. 17

•Bostitch, Inc., E. Greenwich, R. I.
•Bunn, B. H., Tying Machine Co., Chicago
•Diederichs & Griffin Co., Chicago
Felins Tying Machine Co., Milwaukee
•Karstrom Co., Menomonee Falls, Wis.
•Ludlow Corp., Needham Heights, Mass.
Mid-States Steel & Wire Co., Crawfordsville, Ind.
National Bundle Tyer Co., Blissfield, Mich.
Signode Steel Strapping Co., Chicago
Tipper Tie Products of New Jersey, Inc., Union, N. J.
•United Shoe Machinery Corp., Boston
U. S. Steel Supply Div., United States Steel Corp., Chicago
West Engineering Co., Richmond, Va.
Wiretyer Corp., E. Paterson, N. J.

MACHINES, TYPESETTING & LETTERING

American Type Founders, Elizabeth, N. J.
Filmotype Corp., Skokie, Ill.

MACHINES, UNIT PACKAGING

(Forming, Filling & Sealing)

Editorial information, Div. III Sec. 12

•Amaco, Inc., Chicago
Ampoule Machine Co., Long Island City, N. Y.
•Arenco Machine Co., New York
Barraclough, R. W., Ltd., Southport, Lancashire, England
•Bartelt Engineering Co., Rockford, Ill.
•Battle Creek Packaging Machines, Inc., Battle Creek, Mich.
Bell Machine Co., Oshkosh, Wis.
Bemis Bro. Bag Co., St. Louis, Mo.
•Bodolay, Stephen, Inc., Springfield, Mass.
Brecknell, Dolman & Rogers Ltd., Bristol, England
•Brown Filling Machine Co., Sub. Sundstrand Corp., Ann Arbor, Mich.
•Bursak Packaging Machinery Corp., Jackson, Wis.
•Champlain-Zapata Plastics Machinery Co., Caldwell, N. J.
Circle Design & Mfg. Corp., Emerson, N. J.
Cloud Machine Corp., Skokie, Ill.
•Conapac Corp., New York
Delamere & Williams Co., Toronto, Ont.
•FMC Corp., Hudson-Sharp Plant, Green Bay, Wis.
•FMC Corp., Stokes & Smith Plant, Philadelphia
General Packaging Equipment Co., Houston, Texas
Hamac-Hansella Machinery Corp., Palisades Park, N. J.
•Hamac-Hansella Maschinen GmbH, Dusseldorf, Germany
•Hayssen Mfg. Co., Sheboygan, Wis.
Ideal Packagings Ltd., London, England
Ivers-Lee Co., Newark, N. J.
Ketchpel Engineering Co., W. Englewood, N. J.
Lake Industrial Products Co., Chagrin Falls, Ohio
•Lynch Corp., Anderson, Ind.
Mason-Keller Corp., Roseland, N. J.
•Mercury Heat Sealing Equipment Co., Philadelphia
Molins Machine Co., Richmond, Va.
•Nash, J. M., Co., Oshkosh, Wis.
•Package Machinery Co., E. Longmeadow, Mass.
•Pak-Rapid, Inc., W. Conshohocken, Pa.
•Pneumatic Scale Corp., Quincy, Mass.
Polyflex Bag & Container, Inc., Johnstown, N. Y.
•Sanford, William B., Inc., New York
Tetra Pak Co., Union, N. J.
•Triangle Package Machinery Co., Chicago
Vol-Pak, Inc., New York
•Wrap-Ade Machine Co., Clifton, N. J.
•Wright Machinery Corp., Div. Sperry Rand Corp., Durham, N. C.

MACHINES, UNSCRAMBLING

Editorial information, Div. III Sec. 12

A-B-C Packaging Machine Corp., Clearwater, Fla.
Aidlin Automation, Inc., Brooklyn, N. Y.
•Amaco, Inc., Chicago
Andora Automation, Inc., Brooklyn, N. Y.
Atkron, Inc., Cuyahoga Falls, Ohio
Automation Devices, Inc., Erie, Pa.
Biner-Ellison Machinery Co., Los Angeles
Chase Equipment Co., Div. C. W. Logeman Co., Brooklyn, N. Y.
•Chisholm-Ryder Co. of Pa., Hanover, Pa.
Climax Products Div., Lodge & Shipley Co., Cincinnati
•Continental Can Co., White Cap Co., Div., Chicago
Count-O-Matic, Inc., Div. U. S. Engineering Co., Long Island City, N. Y.
Cozzoli Machine Co., Plainfield, N. J.
Dairy Whipt Div., Aerated Container Corp., Chicago
•Economic Machinery Co., Worcester, Mass.
•Emhart Mfg. Co., Portland Div., Portland, Conn.
Filler Machine Co., Philadelphia
•FMC Corp., Canning Machinery Div., San Jose, Calif.
Griswold Engineering Ltd., Montreal, Que.
Hofliger & Karg, Waiblingen bei Stuttgart, Germany
•Horix Mfg. Co., Pittsburgh
Island Equipment Corp., Hialeah, Fla.
Johnson, A., Machine Works, Inc., E. Paterson, N. J.
Kahlenberg-Globe Equipment Co., Sarasota, Fla.
•Kartridg Pak Co., Mount Prospect, Ill.
Laub Engineering Co., San Gabriel, Calif.
M-H Standard Corp., Jersey City, N. J.
•MRM Co., Plainview, N. Y.
•Perry Industries, Inc., Brooklyn, N. Y.
Phillips Associates, Oakland, Calif.
•Pneumatic Scale Corp., Quincy, Mass.
•Production Equipment, Inc., Div. Burnet Co., Paramus, N. J.
Rockport Machine & Tool Co., Cleveland
•Sanford, William B., Inc., New York
•Tol-O-Matic, Inc., Minneapolis
U. S. Bottlers Machinery Co., Chicago
Weigh Right Automatic Scale Co., Joliet, Ill.
Wellington Associates, Phoenixville, Pa.
•Wrap-King Div., Crompton & Knowles Packaging Corp., Agawam, Mass.

MACHINES, VACUUM & GAS PACKING

A. Flexible Packages
B. Rigid Packages

Editorial information, Div. II Sec. 7, Div. III Sec. 12

•American Can Co., Canco Div., New York (B)
•Amaco, Inc., Chicago (B)
•Anchor Hocking Glass Corp., Lancaster, Ohio (B)
Carter Engineering Co., Danville, Ill. (A, B)
Cloud Machine Corp., Skokie, Ill. (A)
•Conapac Corp., New York (A, B)
Delamere & Williams Co., Toronto, Ont. (A)
•Diederichs & Griffin Co., Chicago (A, B)
•FMC Corp., Hudson-Sharp Plant, Green Bay, Wis. (A)
•FMC Corp., Stokes & Smith Plant, Philadelphia (A, B)
Formvac, Zurich, Switzerland (B)
Grace, W. R., & Co., Cryovac Div., Cambridge, Mass. (A)
Griswold Engineering Ltd., Montreal, Que. (A)
•Hayssen Mfg. Co., Sheboygan, Wis. (A)
•Hesser, Fr., Maschinenfabrik AG, Stuttgart-Bad Cannstatt, Germany (A)
•Industrie-Werke Karlsruhe Aktiengesellschaft, Karlsruhe, Germany (A)
•Karstrom Co., Menomonee Falls, Wis. (A)

Addresses of companies listed appear on pp. 808-847

Lerner Machine Co., Ponders End, Middx., England (A)
Mahaffy Engineering Co., Little Ferry, N. J. (A, B)
•Pak-Rapid, Inc., W. Conshohocken, Pa. (A)
•Pneumatic Scale Corp., Quincy, Mass. (B)
Royal Packaging Equipment, Inc., Fort Lee, N. J. (A)
•Standard Packaging Corp., New York (A)

MACHINES, VIBRATORS
(For Packing & Settling)

Editorial information, Div. III Sec. 12

Autopack Ltd., Malvern Link, Worcestershire, England
•Brown Filling Machine Co., Sub. Sundstrand Corp., Ann Arbor, Mich.
Cleveland Vibrator Co., Cleveland
•Fry, George H., Co., Mineola, N. Y.
Griswold Engineering Ltd., Montreal, Que.
•Gump, B. F., Co., Chicago
Jeffrey Mfg. Co., Columbus, Ohio
L. A. B. Corp., Skaneateles, N. Y.
Martin Engineering Co., Neponset, Ill.
•Perry Industries, Inc., Brooklyn, N. Y.
Southall & Smith Ltd., Birmingham, England
Stuyvesant Engineering Corp., Norwood, N. J.
Syntron Co., Homer City, Pa.
Weigh Right Automatic Scale Co., Joliet, Ill.

MACHINES, WIRE STITCHING

Editorial information, Div. III Sec. 13

•Acme Steel Co., Chicago
•Bostitch, Inc., E. Greenwich, R. I.
•Dexter Co., Div. Miehle-Goss-Dexter, Inc., Chicago
Diagraph-Bradley Industries, Inc., Herrin, Ill.
•FMC Corp., Canning Machinery Div., San Jose, Calif.
General Staple Co., New York
Ideal Stitcher Co., Div. W. R. Pabich Mfg. Co., Chicago
Inland Wire Products Co., Crawfordsville, Ind.
Mid-States Steel & Wire Co., Crawfordsville, Ind.
•Mitsui & Co., Tokyo, Japan
Saranac Machine Co., Benton Harbor, Mich.
Vickers-Armstrongs (Engineers) Ltd., London, England

MACHINES, WRAPPING

Editorial information, Div. III Sec. 12

•Amaco, Inc., Chicago
American Machine & Foundry Co., New York
•Amsco Packaging Machinery, Inc., Long Island City, N. Y.
Auto Wrappers (Norwich) Ltd., Norwich, England
Ayers & Grimshaw Ltd., Barnstaple, Devon, England
•Battle Creek Packaging Machines, Inc., Battle Creek, Mich.
•Bodolay, Stephen, Inc., Springfield, Mass.
Brecknell, Dolman & Rogers Ltd., Bristol, England
Clavell Bate & Nephews Ltd., Nelson, Lancashire, England
Cloud Machine Corp., Skokie, Ill.
•Diederichs & Griffin Co., Chicago
Elgin Mfg. Co., Elgin, Ill.
•FMC Corp., Hudson-Sharp Plant, Green Bay, Wis.
•FMC Corp., Stokes & Smith Plant, Philadelphia
•Formatron, Inc., Philadelphia
General Strapping Corp., New York
Geveke & Co., Elmsford, N. Y.
•Hamac-Hansella Maschinen GmbH, Dusseldorf, Germany
•Hayssen Mfg. Co., Sheboygan, Wis.
•Hesser, Fr., Maschinenfabrik AG, Stuttgart-Bad Cannstatt, Germany
Ideal Packagings Ltd., London, England
•Industrie-Werke Karlsruhe Aktiengesellschaft, Karlsruhe, Germany
Lerner Machine Co., Ponders End, Middx., England
•Lynch Corp., Anderson, Ind.
Miller Wrapping & Sealing Machine Co., Chicago
Milwaukee Tool & Machine Co., Milwaukee
Modern Packaging Machinery Co., Van Nuys, Calif.
Molins Machine Co., Richmond, Va.
•National Equipment Corp., New York
•Oliver Machinery Co., Grand Rapids, Mich.
•Package Machinery Co., E. Longmeadow, Mass.
Packaging Laboratories & Designing Ltd., Montreal, Que.
•Packomatic Div., Textile Machine Works, Reading, Pa.
Pierce Wrapping Machine Co., La Grange Park, Ill.
Polyflex Bag & Container, Inc., Johnstown, N. Y.
•Quickpak Machinery Corp., Culver City, Calif.
R E B Trays, Inc., Flourtown, Pa.
•Scandia Packaging Machinery Co., No. Arlington, N. J.
Schultz Engineering Corp., Brooklyn, N. Y.
Sealaround Corp., Chicago
•Sundstrand-American Broach, Div. Sundstrand Corp., Ann Arbor, Mich.
Supermatic Packaging Corp., Union, N. J.
Terkelsen Machine Co., Boston
•Trescott Co., Fairport, N. Y.
Van Buren Machine Corp., Brooklyn, N. Y.
Versapak Film & Packaging Machinery Corp., New York
•Wrap-King Div., Crompton & Knowles Packaging Corp., Agawam, Mass.
•Wright Machinery Co., Div. Sperry Rand Corp., Durham, N. C.

MARKING EQUIPMENT

Editorial information, Div. III Sec. 13

•Ackerman Gould Co., Oceanside, N. Y.
Acro Tool & Die Works, Chicago
•Apex Machine Co., College Point, N. Y.
Atlas Labeling Machine Corp., Long Island City, N. Y.
Automatic Marking Equipment, Inc., New York
Bates Mfg. Co., W. Orange, N. J.
•Beck, Charles, Machine Corp., King of Prussia, Pa.
•Bell-Mark Corp., Bloomfield, N. J.
Bemis Bro. Bag Co., St. Louis, Mo.
•Chisholm-Ryder Co. of Pa., Hanover, Pa.
Cozzone Marking Co., Newark, N. J.
•Dennison Mfg. Co., Framingham, Mass.
Force Western, Inc., Chicago
Force, Wm. A., & Co., Brooklyn, N. Y.
•Gottscho, Adolph, Inc., Hillside, N. J.
•Griffin-Rutgers, Inc., Scarsdale, N. Y.
•Harley, E. L., Inc., Brooklyn, N. Y.
•Hayssen Mfg. Co., Sheboygan, Wis.
Ideal Packagings Ltd., London, England
Ideal Stencil Machine Co., Belleville, Ill.
•Industrial Marking Equipment Co., Brooklyn, N. Y.
International Eastern Co., New York
•Kensol-Olsenmark, Inc., New York
Kimball, A., Co., Brooklyn, N. Y.
Kiwi Coders Corp., Chicago
Lerner Machine Co., Ponders End, Middx., England
•Markem Machine Co., Keene, N. H.
Master Addresser Co., Minneapolis
Matthews, Jas. H., & Co., Pittsburgh
Melind, Louis, Co., Chicago
•Monarch Marking System Co., Dayton, Ohio
Muskegon Marking Equipment Co., Packaging Supplies Div., Muskegon, Mich.
Nalbach, John R., Engineering Co., Chicago
•Packomatic Div., Textile Machine Works, Reading, Pa.
Pan Industrial Corp., New York
Pannier Corp., Pittsburgh
Pryor Marking Products, Chicago
Quality Machine Co., Athens, Ga.
Rockport Machine & Tool Co., Cleveland
Soabar Co., Philadelphia
Sohn Mfg., Inc., Elkhart Lake, Wis.
Speedry Chemical Products, Inc., Richmond Hill, N. Y.
•Sten-C-Labl, Inc., St. Paul, Minn.
Superior Marking Equipment Co., Chicago
Swan Machine Co., New York
Thomas Engineering Co., Skokie, Ill.
Van Buskirk & Co., Bridgeport, Conn.
Verner, B., & Co., New York
Weber Marking Systems, Inc., Mount Prospect, Ill.

PLATES, RUBBER PRINTING

Editorial information, Div. III Sec. 13, Div. IV Sec. 15

Banner Marking Devices Co., Chicago
•Bell-Mark Corp., Bloomfield, N. J.
Flex-O-Plate, Inc., Chicago
•Gottscho, Adolph, Inc., Hillside, N. J.
•Harley, E. L., Inc., Brooklyn, N. Y.
•Industrial Marking Equipment Co., Brooklyn, N. Y.
•Manhasset Machine Co., Amityville, N. Y.
•Markem Machine Co., Keene, N. H.
Matthews, Jas. H., & Co., Pittsburgh
Melind, Louis, Co., Chicago
Mosstype Corp., Waldwick, N. J.
Pannier Corp., Pittsburgh
Paper Converting Machine Co., Green Bay, Wis.
Para Plate & Plastics Co., Los Angeles
Pontiac Graphics, Chicago
•Porter & Dugas, Inc., Chicago
Pryor Marking Products, Chicago
Rau Rubber Engraving Co., Hackensack, N. J.
West Essex Printing Plates, Inc., Caldwell, N. J.

PRESSES, PRINTING

A. Flexographic
B. Letterpress
C. Lithographic
D. Rotogravure
E. Silk Screen
F. Offset

Editorial information, Div. IV Sec. 15

American Type Founders, Elizabeth N. J. (A, B, C, D)
•Apex Machine Co., College Point, N. Y. (A, E)
•Appleton Machine Co., Appleton, Wis. (A)
Atlas Silk Screen Supply Co., Chicago (E)

•Black-Clawson Co., Dilts Div., Fulton, N. Y. (A, C)
•Bostitch, Inc., E. Greenwich, R. I. (A)
Brecknell, Dolman & Rogers Ltd., Bristol, England (B)
Cerutti Presses of America, Inc., Westfield, N. J. (A, D)
•Champlain Co., Roseland, N. J. (A, D)
Cobden Chadwick, Ltd., Oldham, Lancs., England (A)
•Conapac Corp., New York (A, D)
Cosom Corp., Minneapolis (A, B)
Cottrell Co., Westerly, R. I. (A, B, C, D)
Dependable Compressor & Machine Co., New York (E)
Dietz Machine Works, Inc., Philadelphia, (A)
Egan, Frank W., & Co., Somerville, N. J. (D)
•FMC Corp., Hudson-Sharp Plant, Green Bay, Wis. (A, B, D)
Faustel, Inc., Butler, Wis. (A, D)
Frostad Engineering Co., Milwaukee (A, B, D)
Geveke & Co., Elmsford, N. Y. (A, D)
Hamilton Tool Co., Hamilton, Ohio (A, B, C, D)
•Harley, E. L., Inc., Brooklyn, N. Y. (A)
Harris-Seybold Co., Div. Harris-Intertype Corp., Cleveland (B, C)
Heidelberg Eastern, Inc., Glendale, N. Y. (B)
•Heinrich Equipment Corp., New York (A)
Helix Machine Co., Hicksville, N. Y. (A, D)
•Index Industrial Corp., New York (F)
•Inta-Roto Machine Co., Richmond, Va. (A, D)
International Eastern Co., New York (B, E)
•International Paper Box Machine Co., Nashua, N. H. (B)
KamRu Products Corp., Elyria, Ohio (A, B)
•Kidder Press Co., Dover, N. H. (A, B, D)
Lembo Machine Works, Inc., Paterson, N. J. (D)
Macey, Avery, International Corp., New York (D)
•Manhasset Machine Co., Amityville, N. Y. (A, B)
•Markem Machine Co., Keene, N. H. (E)
Mecca Machinery Co., Long Island City, N. Y. (A, D)
•Mercury Engineering Corp., Sub. Miehle-Goss-Dexter, Inc., Milwaukee (A, D)
•Miehle Co., Div. Miehle-Goss-Dexter, Inc., Chicago (B, C, D)
Miller Printing Machinery Co., Pittsburgh (B, C)
•Mitsui & Co., Tokyo, Japan (B, C)
•New Era Mfg Co., Hawthorne, N. J. (B)
Nordisk Plaster Industri A/S, Copenhagen, Denmark (A)
Pan Industrial Corp., New York (E)
Paper Converting Machine Co., Green Bay, Wis. (A, B)
Paper Machinery Corp, Milwaukee (A)
•Porter & Dugas, Inc., Chicago (A, B)
Potdevin Machine Co., Teterboro, N. J. (A, B)
Pratt Mfg. Corp., Milwaukee (D)
Pryor Marking Products, Chicago (A, B)
Repro Design & Experiment Co., Linden, N. J. (A, C)
Rockport Machine & Tool Co., Cleveland (A)
•Royal Zenith Corp., New York (C)
St. Regis Paper Co., New York (A)
Shannon, Alexander J., Co., Fonda, N. Y. (D)
Sohn Mfg., Inc., Elkhart Lake, Wis. (A)
Swan Machine Co., New York (A)
Thomson-National Press Co., Franklin, Mass. (A, B, C)
Verner, B., & Co., New York (B)
West Engineering Co., Richmond, Va. (A, B)
West Essex Printing Plates, Inc., Caldwell, N. J. (A)
Western Gear Corp., Lynwood, Calif. (B, C, D)
•Wolverine Flexographic Mfg. Co., Detroit (A)

PRESSES, PRINTING & BLANKING

(Cutting, Creasing, Stripping)

Editorial information, Div. III Sec. 14, Div. IV Sec. 15

Cerutti Presses of America, Inc., Westfield, N. J.
•Champlain Co., Roseland, N. J.
Ex-Cell-O Corp., Ex-Cell-O-Staude Dept., Detroit
Frostad Engineering Co., Milwaukee
•Hesser, Fr., Maschinenfabrik AG, Stuttgart-Bad Cannstatt, Germany
•Mercury Engineering Corp., Sub. Miehle-Goss-Dexter, Inc., Milwaukee
•Miehle Co., Div. Miehle-Goss-Dexter, Inc., Chicago
Paper Machinery Corp., Milwaukee
S & S Corrugated Paper Machinery Co., Brooklyn, N. Y.
Sohn Mfg., Inc., Elkhart Lake, Wis.
Thomson-National Press Co., Franklin, Mass.
West Engineering Co., Richmond, Va.

PRESSES, RUBBER PRINTING PLATE

Editorial information, Div. IV Sec. 15

Elliott Mfg. Co., Fresno, Calif.
•Harley, E. L., Inc., Brooklyn, N. Y.
•Kidder Press Co., Dover, N. H.
Melind, Louis, Co., Chicago

PRESSURE FORMING EQUIPMENT

(See Machines, Thermoforming)

PRINTING EQUIPMENT

A. Cylinders
B. Engraving Equipment
C. Extension Deliveries
D. Ink Pumps
E. Offset Blankets
F. Plates
G. Silk Screens
H. Tape Printers
I. Plate Preparation

Editorial information, Div. IV Sec. 15

Acme Gravure Services, Inc., Rolling Meadows, Ill. (A)
•Amaco, Inc., Chicago (G)
American Type Founders, Elizabeth, N. J. (E, F)
•Apex Machine Co., College Point, N. Y. (H)
Atlas Silk Screen Supply Co., Chicago (G)
Beck Engraving Co., Philadelphia (A, F)
•Bell-Mark Corp., Bloomfield, N. J. (F, H)
•Consolidated Engravers, Div. American-Marietta Co., Charlotte, N. C. (A)
Cozzone Marking Co., Newark, N. J. (A, H)
•FMC Corp., Hudson-Sharp Plant, Green Bay, Wis. (A)
Frostad Engineering Co., Milwaukee (H)
Gravure Cylinder Corp., Hoboken, N. J. (A)
Gray Co., Minneapolis (D)
Graymills Corp., Chicago (D)
Helix Machine Co., Hicksville, N. Y. (A)
•Index Industrial Corp., New York (A, E)
•Intaglio Service Corp, New York (A)
•Inta-Roto Machine Co., Richmond, Va. (A)
International Eastern Co., New York (E)
•Kidder Press Co., Dover, N. H. (A)
Kiwi Coders Corp., Chicago (H)
Lembo Machine Works, Inc., Paterson, N. J. (A)
Levey, Fred'k. H., Co., New York (A, F)
•Manhasset Machine Co., Amityville, N. Y. (A)
•Markem Machine Co., Keene, N. H. (G, H)
Marsh Stencil Machine Co., Belleville, Ill. (H)
Mecca Machinery Co., Long Island City, N. Y. (A)
Minnesota Mining & Mfg. Co., St. Paul, Minn. (F)
Mosstype Corp., Waldwick, N. J. (A, F)
•New Era Mfg. Co., Hawthorne, N. J. (H)
Pamarco, Inc., Roselle, N. J. (A)
Pan Industrial Corp., New York (G)
Pneuma-Flo Systems, Inc., New York (D)
Polychrome Corp., Yonkers, N. Y. (E, F)
•Porter & Dugas, Inc., Chicago (F)
Printing Machinery Co., Cincinnati (A)
Pryor Marking Products, Chicago (F)
Rapid Roller Co., Chicago (E)
Rau Rubber Engraving Co., Hackensack, N. J. (F)
Rockport Machine & Tool Co., Cleveland (H)
•Roto Cylinders, Inc., Palmyra, N. J. (A)
•Royal Zenith Corp., New York (B, I)
Shannon, Alexander J., Co., Fonda, N. Y. (A)
Sinclair & Valentine Co., Printing Ink Div., American-Marietta Co., New York (E, F)
Sohn Mfg., Inc., Elkhart Lake, Wis. (H)
Southern Gravure Service, Inc., Louisville, Ky. (A)
Sun Chemical Corp., New York (E, H)
United States Rubber Co., New York (E)
Van Buskirk & Co., Bridgeport, Conn. (D)
West Engineering Co., Richmond, Va. (A)
Wilsolite Corp., Buffalo, N. Y. (E)
•Wolverine Flexographic Mfg. Co., Detroit (A)

PRINTING PLATE SUPPLIERS

(See same heading in Materials & Supplies Section)

ROLLERS

A. Embossing
B. Printing
C. Rubber Design

Editorial information, Div. IV Sec. 15

•Ackerman Gould Co., Oceanside, N. Y. (A)
Alclyde Engraving Co., Chatham, N. J. (A)
•Apex Machine Co., College Point, N. Y. (B)
•Appleton Machine Co., Appleton, Wis. (A)
Bayberry Products Corp., Stamford, Conn. (B)
California Ink Co., San Francisco (B)

Chambers-Storck Co., Norwich, Conn. (B)
Cobden Chadwick Ltd., Oldham, Lancs., England (B)
•Consolidated Engravers Div., American-Marietta Co., Charlotte, N. C. (A, B)
•FMC Corp., Hudson-Sharp Plant, Green Bay, Wis. (A, B)
Goodrich, B. F., Industrial Products Co., Akron, Ohio (A, B)
•Goodyear Tire & Rubber Co., Akron, Ohio (B, C)
Gravure Cylinder Corp., Hoboken, N. J. (B)
Helix Machine Co., Hicksville, N. Y. (B)
Ideal Roller & Mfg. Co., Chicago (A, B)
•Industrial Marking Equipment Co., Brooklyn, N. Y. (B)
Jomac, Inc., Philadelphia (B)
Lembo Machine Works, Inc., Paterson, N. J. (A, B)
•Manhasset Machine Co., Amityville, N. Y. (B)
Matthews, Jas. H., & Co., Pittsburgh (A, B)
Mecca Machinery Co., Long Island City, N. Y. (B)
Minnesota Mining & Mfg. Co., St. Paul, Minn. (B)
Mosstype Corp., Waldwick, N. J. (C)
Pamarco, Inc., Roselle, N. J. (A, B)
Paper Converting Machine Co., Green Bay, Wis. (A)
Perkins, B. F., & Son., Inc., Holyoke, Mass (A)
Perma-Flex Industries Ltd., Toronto, Ont. (B)
Perma-Flex Roller Corp., Buffalo, N. Y. (B)
Rapid Roller Co., Chicago (B)
Roehlen Engraving Works, Rochester, N. Y. (A)
Shannon, Alexander J., Co., Fonda, N. Y. (A, B)
Superior Marking Equipment Co., Chicago (B)
Swan Machine Co., New York (A, B)
United States Rubber Co., New York (C)
West Essex Printing Plates, Inc., Caldwell, N. J. (C)
•Wolverine Flexographic Mfg. Co., Detroit (B)

SCALES

A. *Automatic Check Weighers*
B. *Conveyor*
C. *Freight, Express & Parcel Post (Computing)*
D. *Over & Under Weight*
E. *Weight Printing*

Editorial information, Div. III Sec. 12, 13

•Amaco, Inc., Chicago (A)
Detecto Scales, Inc., Brooklyn, N. Y. (B, C, D, E)
•Diederichs & Griffin Co., Chicago (A, B)
East Chicago Machine Tool Corp., East Chicago, Ind. (B)
Exact Weight Scale Co., Columbus, Ohio (A, B, D, E)
•FMC Corp., Stokes & Smith Plant, Philadelphia (A)
Flexoveyor Mfg. Co., Denver, Colo. (B)
Geveke & Co., Elmsford, N. Y. (A)
Gilman Paper Co., New York (A)
•Hesser, Fr., Maschinenfabrik AG, Stuttgart-Bad Cannstatt, Germany (A)
Hi-Speed Checkweigher Co., Ithaca, N. Y. (A)
Hofliger & Karg, Waiblingen bei Stuttgart, Germany (A)
Howe Scale Co., Rutland, Vt. (A, B, D, E)
•Illumitronic Systems Corp., Sunnyvale, Calif. (A, D)
•Index Industrial Corp., New York (A)
Jeffrey Mfg. Co., Columbus, Ohio (B)
•Karstrom Co., Menomonee Falls, Wis. (A, B)
•Mettler Instrument Corp., Princeton, N. J. (A, D)
Pitney-Bowes, Inc., Stamford, Conn. (C)
Richardson Scale Co., Clifton, N. J. (A, E)
•Sanford, William B., Inc., New York (A)
Scale Specialties, Inc., Denville, N. J. (A, D)
Southall & Smith Ltd., Birmingham, England (A)
Streeter-Amet, Grayslake, Ill. (A, B, E)
Thayer Scale Corp., Pembroke, Mass. (A, B)
Toledo Scale, Div. Toledo Scale Corp., Toledo, Ohio (A, B, C, D, E)
Torsion Balance Co., Clifton, N. J. (D)
Tri Pak Machinery Service, Inc., Harlingen, Texas (D)
Union Bag-Camp Paper Corp., New York (A, B)
•Wrap-King Div., Crompton & Knowles Packaging Corp., Agawam, Mass. (A)
•Wright Machinery Co., Div. Sperry Rand Corp., Durham, N. C. (A)
Wright Machinery Co., Colnbrook, Bucks., England (A, B, D)

SCALES, WEIGHING & FILLING

(See also Machines, Filling, Dry)

Editorial information, Div. III Sec. 12, 13

•Amaco, Inc., Chicago
Automatic Scale Co., New York
Autopack Ltd., Malvern Link, Worcestershire, England
Black Products Co., Chicago
Coddington, E. D., Mfg. Co., Milwaukee
•Consolidated Packaging Machinery Corp., Buffalo, N. Y.
Detecto Scales, Inc., Brooklyn, N. Y.
•Diederichs & Griffin Co., Chicago
Exact Weight Scale Co., Columbus, Ohio
Exactron, Inc., Dumont, N. J.
•Frazier & Son, Clifton, N. J.
Gilman Paper Co., New York
Glengarry Processes, Inc., Bay Shore, N. Y.
•Gump, B. F., Co., Chicago
•Hesser, Fr., Maschinenfabrik AG, Stuttgart-Bad Cannstatt, Germany
Hofliger & Karg, Waiblingen bei Stuttgart, Germany
Howe Scale Co., Rutland, Vt.
•Karstrom Co., Menomonee Falls, Wis.
•Lynch Corp., Anderson, Ind.
•Mercury Heat Sealing Equipment Co., Philadelphia
Mettler Instrument Corp., Princeton, N. J.
Olofsson Corp., Lansing, Mich.
•Pack-Rite Machines, Div. Techtmann Industries, Inc., Milwaukee
•Pneumatic Scale Corp., Quincy, Mass.
Richardson Scale Co., Clifton, N. J.
Roberts Patent Filling Machine Co., Bolton, Lancs., England
St. Regis Paper Co., New York
•Sanford, William B., Inc., New York
Southall & Smith Ltd., Birmingham, England
Thayer Scale Corp., Pembroke, Mass.
Toledo Scale, Div. Toledo Scale Corp., Toledo, Ohio
•Triangle Package Machinery Co., Chicago
Union Bag-Camp Paper Corp., New York
•U. S. Automatic Box Machinery Co., Boston
Weigh Right Automatic Scale Co., Joliet, Ill.
•Wright Machinery Co., Div. Sperry Rand Corp., Durham, N. C.
Wright Machinery Co., Colnbrook, Bucks., England

STENCIL-MAKING EQUIPMENT

Editorial information, Div. III Sec. 13

Diagraph-Bradley Industries, Inc., Herrin, Ill.
Ideal Stencil Machine Co., Belleville, Ill.
Marsh Stencil Machine Co., Belleville, Ill.
Matthews, Jas. H., & Co., Pittsburgh
Pannier Corp., Pittsburgh
•Sten-C-Labl, Inc., St. Paul, Minn.
Weber Marking Systems, Inc., Mount Prospect, Ill.

TESTING EQUIPMENT

Editorial information, Div. I Sec. 2, Div. V Sec. 17

Aidlin Automation, Inc., Brooklyn, N. Y.
Barry Controls, Div. Barry Wright Corp., Watertown, Mass.
Brabender, C. W., Instruments, Inc., So. Hackensack, N. J.
Cady, E. J., & Co., River Forest, Ill.
Dice, J. W., Co., Englewood, N. J.
Gaynes Engineering Co., Chicago
Hi-Speed Checkweigher Co., Ithaca, N. Y.
Impact-O-Graph Corp., Cleveland
Inertia Switch, Inc., New York
Instrument Development Laboratories, Inc., Attleboro, Mass.
International Ultrasonics, Inc., Cranford, N. J.
L. A. B. Corp., Skaneateles, N. Y.
Liberty Engineering Co., Beloit, Wis.
McDougall Control Co., Seattle, Wash.
Minden Paper Gauge Co., New York
Norcross Corp., Newton, Mass.
Paper Industry Instruments, Cleveland
Peco Corp., Mountain View, Calif.
Perkins, B. F., & Son, Inc., Holyoke, Mass.
Pyrometer Service Co., No. Arlington, N. J.
Robins Engineering Co., No. Haven, Conn.
Standard Instrument Corp., New York
•Taber Instrument Corp., No. Tonawanda, N. Y.
Tenney Engineering, Inc., Union, N. J.
Testing Machines, Inc., Mineola, N. Y.
Thwing-Albert Instrument Co., Philadelphia
Torsion Balance Co., Clifton, N. J.
Uni Pak Corp., Los Angeles

DISTRIBUTORS, JOBBERS & SALES AGENTS

(The following sell a variety of Machines and in some instances also service them.)

Abana Products, Inc., Chicago
Acepak, Inc., Chicago
Advance Process Supply Co., Chicago
Allied Commodities Co., Minneapolis
Allied Equipment Co., Yonkers, N. Y.
American Bottlers Equipment Co., Baltimore, Md.
American Type Founders, Elizabeth, N. J.
Anderson, R. P., Co., Dallas, Texas
Atlas-Sandt Corp., New York
Axberg, A. H., & Associates, New York
Ballthrall Engineering Co., Philadelphia
Bracamonte, R. M., & Co., San Francisco
Bradley, Dick, Co., Nashville, Tenn.
COSECO, Los Angeles
Carney & McReynolds, Chicago
Chemical & Pharmaceutical Industry Co., New York
Chisholm Sales & Engineering Co., Niagara Falls, Ont.

Clowe, H. W., & Co., Jackson, Miss.
Colburn, Harold E., Rochester, N. Y.
Collins, H. Tom, Chicago
Condes Corp., Milwaukee
Containers Machinery Co., Wilmette, Ill.
Cooper, D. C., Co., Chicago
Cornelius, Theodore, New York
Craftsmen Machinery Co., Boston
Crystal-X Corp., Lenni Mills, Pa.
Davis, John R., & Co., Chamblee, Ga.
Diverse Products, Brooklyn, N. Y.
Dorey Corrugated Paper Products, Inc., Scottsville, N. Y.
Duncan Equipment Co., Seattle, Wash.
Emerson Labeltape & Supply Corp., Brooklyn, N. Y.
Emmer Glass Corp., Miami, Fla.
Fisler, Royal E., Co., St. Louis, Mo.
Gay Sales Co., Houston, Texas
General Staple Co., New York
Geveke & Co., Elmsford, N. Y.
Gilbert, Jack M., & Co., Kansas City, Mo.
Globe Mfg. Co., Philadelphia
Gould, Stephen, Paper Co., Bayonne, N. J.
Greggory, Inc., Chicago
Griswold Engineering Ltd., Montreal, Que.
Haberland, William E., Bloomfield, N. J.
Halsell Brokerage Co., Denver, Colo.
Hancor, Inc., New York
Handel-Davies Co., Cleveland
Hile, W. K., Co., Charlotte, N. C.
Horne Machinery Co., San Francisco
Hurwich, R., Co., Berkeley, Calif.
Industrial Packaging Installations Ltd., Vancouver, B. C.
Inglis, John T., Co., Fayetteville, N. Y.
Inland Wire Products Co., Crawfordsville, Ind.
Inlander-Steindler Paper Co., Chicago
Inpak Systems, Inc., New York
Ison Co., Atlanta, Ga.
Jaco Equipment Corp., Buffalo, N. Y.
Kansteiner, Walter H., Machinery Co., Chicago
King Sales & Engineering Co., San Francisco
King, Watts, Co., Los Angeles
Kurhan Co., New York
L. & M. Sales Co., Chicago
Lake Industrial Products Co., Chagrin Falls, Ohio
Larson Packaging Equipment Co., St. Louis, Mo.
LeFan, C. H., Co., Dallas, Texas
Levine, Theo. R., & Sons, Paterson, N. J.
Loeb Equipment Supply Co., Chicago
Lucas Sales Co., Oklahoma City, Okla.
Macey, Avery, International Corp., New York
Mackay, Thomas W., & Son Ltd., Vancouver, B. C.
Maguire, J. P., Co., New Orleans, La.
Mantes, T. R., Co., San Francisco
Markel Co., Sub. Morris L. Lewy & Co., New York
McCambridge Packaging Equipment Co., Chicago
McMackin, Hugh J., Co., Boston
Miller-Lenfestey Supply Co., Tampa, Fla.
Muro Plastics Co., Seattle, Wash.
Norso Trading Co., New York
Nowland, A. C., Co., Philadelphia
Odman, Irving L., Co., Chicago
Omni Products Corp., New York
Packageers Co., Chicago
Packaging Equipment Co., Atlanta, Ga.
Packaging Equipment Co., Brooklyn, N. Y.
Packaging Laboratories & Designing Ltd., Montreal, Que.
Packaging Pioneers, Inc., Tuckahoe, N. Y.
Pacon Machines Corp., New York
Palmer Supplies Co. of Florida, Miami Springs, Fla.
Payne, Ernest, Corp., New York
Peerless Confectionery Equipment Co., New York
Phillips Associates, Oakland, Calif.
Phin Sales Co., Toronto, Ont.
Plastics & Equipment Sales Co., Morton Grove, Ill.
Pro-Pak, Portland, Ore.
Rainville Co. of New England, Woodstock, Conn.
Rapistan Canada Ltd., Toronto, Ont.
Raymond Bag Corp., Div. Albemarle Paper Mfg. Co., Richmond, Va.
Richardson Agencies Ltd., Toronto, Ont.
Riekes Equipment Co., Omaha, Neb.
Robins, A. K., & Co., Baltimore, Md.
Schroeder-McKey Co., Milwaukee
Shaw, Frank, Co., Los Angeles
Shelly, W. B., & Co., Toronto, Ont.
Shield & Raymond, Old Greenwich, Conn.
Southern Industry Sales Co., Arlington, Texas
Southwestern Controls, Houston, Texas
Spec-Fab Co., Riverton, N. J.
Specialized Packaging Engineering Co., Phoenix, Ariz.
Standard Paper Box Machine Co., New York
Stewart, H. R., Enterprises, Bryn Mawr, Pa.
Taylor, Page, Nutley, N. J.
Thomas Engineering Co., Skokie, Ill.
•Union Standard Equipment Co., New York
Wagner, Edward A., & Assoc., Dallas, Texas
Webster Equipment Co., Chicago
Wendig Associates, Feasterville, Pa.
Whitney, L. A., & Co., Needham, Mass.
Williams Sales Co., Cincinnati
Wilmod Machinery Co., Toronto, Ont.
Winterer Packaging Assoc., Minneapolis
Wraps, Inc., New York
York Products Co., Los Altos, Calif.

Services Section

ASSOCIATIONS, TRADE & EDUCATIONAL

Adhesives Mfrs. Assn. of America, New York
All Bound Box Institute, Jacksonville Beach, Fla.
Aluminum Foil Container Mfrs. Assn., Inc., Pittsburgh
American Management Assn., New York
American Meat Institute, Chicago
American Research Merchandising Institute, Chicago
American Society for Testing Materials, Philadelphia
American Society of Industrial Designers, New York
American Standards Assn., Inc., New York
American Veneer Package Assn., Orlando, Fla.
Associated Cooperage Industries of America, Inc., St. Louis, Mo.
Can Manufacturers Institute, Washington, D. C.
Canning Machinery & Supplies Assn., Washington, D. C.
Chemical Specialties Mfrs. Assn., Inc., New York
Collapsible Tube Mfrs. Council, New York
Dairy Industries Supply Assn., Inc., Washington, D. C.
Danish Packaging Institute, Copenhagen, Denmark
Envelope Mfrs. Assn. of America, New York
Fibre Box Assn., Chicago
Folding Paper Box Assn. of America, Chicago; New York
Food Packaging Council, Chicago
Food Tray Assn., New York
Gift Wrappings & Tyings Assn., New York
Glass Container Mfrs. Institute, New York
Glassine & Greaseproof Mfrs. Assn., New York
Gummed Industries Assn., New York
Industrial Bag & Cover Assn., New York
Institute of Food Technologists, Chicago
Institute of Paper Chemistry, Appleton, Wis.
Kraft Paper Assn., Inc., New York
Label Mfrs. Assn., Washington, D. C.
Laminated Foil Mfrs. Assn., Providence, R. I.
Lead Industries Assn., New York
Lithographers & Printers National Assn., Washington, D. C.
Lithographic Technical Foundation, Inc., New York
Manufacturing Chemists' Assn., Inc., Washington, D. C.
Marking Device Assn., Evanston, Ill.
Milk Bottle Crate Mfrs. Council, Cleveland
Milk Carton Quality Preforming Council, Chicago
National Assn. of Frozen Food Packers, Washington, D. C.
National Assn. of Glue Mfrs., Inc., New York
National Assn. of Printing Ink Makers, New York
National Assn. of Sanitary Milk Bottle Closure Manufacturers, Philadelphia
National Barrel & Drum Assn., Inc., Washington, D. C.
National Canners Assn., Washington, D. C.
National Fibre Can & Tube Assn., Washington, D. C.
National Flexible Packaging Assn., Cleveland
National Paper Box Mfrs. Assn., Philadelphia
National Paperboard Assn., Chicago
National Wooden Box Assn., Washington, D. C.
National Wooden Pallet Mfrs. Assn., Washington, D. C.
Package Designers Council, New York
Packaging Assn. of Canada, Toronto, Ont.

Addresses of companies listed appear on pp. 808-847

Packaging Institute, Inc., New York
Packaging Machinery Manufacturers Institute, Inc., New York
Paper Bag Institute, Inc., New York
Paper Can Assn., Philadelphia
Paper Cup & Container Institute, New York
Paper Pail Assn., Chicago
Paper Shipping Sack Mfrs. Assn., New York
Paraffined Carton Assn., Chicago
Plastic Food Container Assn., Chicago
Point-of-Purchase Advertising Institute, Inc., New York
Pressure Sensitive Tape Council, Glenview, Ill.
Produce Packaging Assn., Inc., Newark, Del.
Roll Label Mfrs. Assn., Washington, D. C.
Screen Process Printing Assn., Chicago
Society of Packaging & Handling Engineers, Chicago
Society of the Plastics Industry, Inc., New York
Solid Fibre Box Group, Washington, D. C.
Specialty Paper & Board Affiliates, Inc., New York
Staple & Stapling Machine Mfrs. Assn., New York
Steel Shipping Container Institute, Inc., New York
Sulphite Paper Mfrs. Assn., New York
Technical Assn. of the Pulp & Paper Industry, New York
Textile Bag Mfrs. Assn., Evanston, Ill.
United States Trademark Assn., New York
Waterproof Paper Mfrs. Assn., Inc., New York
Waxed Paper Merchandising Council, Inc., Chicago
Western Wooden Box Assn., San Francisco
Wirebound Box Mfrs. Assn., Chicago
Wooden Box Institute, San Francisco

COATING, MACHINE PARTS

(See Coatings & Tapes, Special, in Materials and Supplies Section)

CONTRACT PACKAGING

A. Dry Products
B. Liquid Products
C. Pressure-Packed (Aerosols)
D. Packing & Crating
E. Hand Operations

Editorial information, Div. I Sec. 2

ARIZONA

Specialized Packaging Engineering Co., Phoenix (D, E)

CALIFORNIA

Bishop, William, Co., Burbank (A, B, E)
Blue Cross Laboratories, No. Hollywood (A, B)
Hurwich, R., Co., Berkeley (A, B, E)
Jones-Hamilton Co., Newark (A, B)
Kolar Laboratories, Inc., Chicago (B, E)
Lawson Chemical Products Co., Gardena (C)
Multi-Pak Corp., Sun Valley (A, B, E)
Norton Chemical Co., Los Angeles (A, B, E)
•Packaging Corp. of America, Los Angeles (A, B, D, E)
Steven, William, Co., Los Angeles (A, B)
Uni Pak Corp., Los Angeles (A, E)
Weaver Packaging Co., Montrose (A, D, E)
Western Filling Corp., Los Angeles (C)
Wilco Co., Los Angeles (A, B, E)

CONNECTICUT

Commerce Packaging Corp., Stamford (D, E)
General Aerosols, Inc., Shelton (C)
Guard All Chemical Co., So. Norwalk (B, D, E)
Manufacturers Box Co., Bridgeport (E)
Westwill Corp., Norwalk (B)

DELAWARE

Pace, Inc., Wilmington (A, B, C, E)
Packaging Services, Inc., Wilmington (A, B, E)

DISTRICT OF COLUMBIA

Packaging & Converting Co., Washington (D)

FLORIDA

Averil, Inc., Miami (A, B, E)
Southern Packaging Service, Jacksonville (B)

ILLINOIS

Ace Export Packing Co., Chicago (A, B, D, E)
Acepak, Inc., Chicago (A, B, E)
Acme Packing Co., Chicago (A, B)
Advance Packaging Co., Chicago (A, B, E)
Aeropak, Inc., Chicago (A, B, C)
Barco Chemical Products Co., Chicago (B)
Barr, G., & Co., Chicago (C)
Capitol Packaging Co., Melrose Park (B, C)
Chase Products Co., Broadview (C)
Chemical Enterprises, Chicago (A, B, E)
Claron Packaging Corp., Skokie (A)
De Soto Chemical Coatings, Inc., Chicago (B, C)
Federal Packaging Corp., Chicago (A, B, E)
Help, Inc., Chicago (A, B, E)
Packaging Service Corp., Chicago (A, B, E)
Peterson Filling & Packaging Co., Danville (B, C)
Sprayway, Inc., Chicago (C)
Triple-X Chemical Laboratories, Inc., Chicago (A, B, E)
Unipak Corp., Chicago (A, B)

INDIANA

Universal Packaging, Inc., Plainfield (A, B, E)

KENTUCKY

Strobel Products, Inc., Louisville (C)

MASSACHUSETTS

Armstrong Laboratories, Inc., W. Roxbury (B, C)
Brockton Contract Packaging, Brockton (A, B)
Packet Research Corp., Boston (A, B)
Pioneer Folding Box, Inc., Chicopee (E)
Puritan Aerosol Corp., Boston (B, C)
Sentry Products Co., Boston (A, B)
Shield Chemical Co., Hyde Park (C, D, E)
Tubed Chemicals Corp., Easthampton (A, B, E)

MICHIGAN

Liquipak Corp., Alma (B)
Michigan Industrial Packaging, Inc., Grand Rapids (A, D, E)

MISSOURI

All Packaging Co., Kansas City (A, D, E)
Douglas Chemical Co., No. Kansas City (A, B, D, E)
Kantol Packaging Co., St. Louis (A, B, E)

NEW JERSEY

Acrolite Products, Inc., Rahway (B, C)
Bock Enterprises, Inc., Newark (A, B, E)
•Colonial Applicator Co., Vineland (A)
Custom Packaging, Inc., Newark (A, B, E)
•Dumont, Inc., Englewood (A, B, D, E)
•Dyn Corp., Cliffside Park (A, B, D, E)
•Fluid Chemical Co., Newark (A, B, C, E)
Ivers-Lee Co., Newark (A, B, D, E)
Karp Co., Jersey City (A, E)
Lawson Packaging Corp., Englewood (A, E)
Manufacturers Aid Co., Hoboken (A, B, E)
Martex Co., Vineland (A, B, D, E)
Mason-Keller Corp., Roseland (A, B)
Monroe-Danford & Co., Weehawken (A, B)
Newark Packing Co., Newark (A)
Park Packaging Co., New Brunswick (A, B, D, E)
•Slick Shine Co., Newark (A, B, D, E)

NEW YORK

A-M-R Chemical Co., Brooklyn (A, B, C, D, E)
AP Applicator Co., Pleasantville (E)
Associated Brands, Inc., Brooklyn (B, C)
Bard Pharmaceuticals, Inc., Yonkers (A, B, D, E)
Beacon Packing Co., Brooklyn (A, B)
Bestcraft Products Co., New York (D, E)
Brownie Mfg. Co., New York (A, E)
Carbona Products Co., Long Island City (B)
Clear-Vu Packaging Corp., New York (A, E)
Crown Aerosol Products Co., Hollis (C)
Cumberland Packing Co., Brooklyn (A, B, E)
Custom Merchandise Corp., Brooklyn (A, E)
Edlaw Packaging Co., Glendale (A)
Evans Chemetics, Inc., New York (A, B)
Feder Industries, Inc., New York (E)
Gotham Plastics Co., Bronx (E)
Impact Container Corp., Alden (B, C)
"J" Chemical Works, New York (A, B)
Kolmar Laboratories, Inc., Port Jervis (A, B, C, D, E)
Lee Packaging Laboratories, Inc., Brooklyn (A, D, E)
Leedpak, Inc., New York (A, B, D, E)
Martin, Andrew M., Co., Ossining (B)
Marvell Pharmacal Co., New York (B, E)
Merit Packaging & Equipment Corp., Mineola (A, B, E)
New Jersey Transparent Co., Brooklyn (A, E)
Package Consultants, Inc., Brooklyn (A, B)
•Packaging Components, Inc., New York (E)
Rainbow Packaging Co., New York (A, E)
Sonorol Laboratories, New York (B)
Sprapak Chemicals, Inc., Brooklyn (A, B, C)
Talmalin Mfg. Co., New York (A)
Trans-Packers, Inc., Brooklyn (A)
Trefolex, Inc., New York (A, B, E)
Visual Packaging Co., Brooklyn (A, E)
Wood & Brooks Co., Div. Aurora Corp. of Illinois, Buffalo (D, E)

OHIO

- •American Packaging Corp., Cleveland (A, B, E)
- Bernard's Laboratories, Inc., Cincinnati (A, B, E)
- Chem-Pack, Inc., Cincinnati (A, B, E)
- Custom-Pak, Inc., Cincinnati (A, B, D)
- Eveready Pressurized Products, Inc., Cleveland (B, C)
- •Injection Molders Supply Co., Cleveland (C)
- Paisley, T. J., Co., Medina (A, B, E)
- Plasti-Kote, Inc., Cleveland (C)
- •Products Packaging, Inc., Cleveland (A, B, C, E)
- Sprayon Products, Inc., Cleveland (C)
- Strong Cobb Arner, Inc., Cleveland (A, B, C, E)
- Wright Package, Inc., Cincinnati (A, B, E)

PENNSYLVANIA

- Contract Packaging Corp., W. Conshohocken (A)
- Diaphane Corp., Philadelphia (A, B, E)
- Long, Bert, Contract Packers, Lancaster (A, E)
- Pittsburgh Penn Oil Co., Pittsburgh (B)
- Pressure Products Co., West Chester (C)
- Service Industries, Philadelphia (A, B, D, E)
- Stevens-Wiley Mfg. Co., Philadelphia (A)
- United Packaging Co., Philadelphia (A, D, E)
- Windsor Chemical Laboratories, Div. Approved Products, Inc., Philadelphia (B, C, E)

TENNESSEE

- Aerosol Corp. of the South, Arlington (C)

WASHINGTON

- Northwestern Paper Co., Seattle (A, E)

WISCONSIN

- •Bursak Packaging Machinery Corp., Jackson (A, B)
- Western Coil & Electrical Co., Racine (A, E)

CANADA

- Aerocide Dispensers Ltd., Rexdale, Ont. (A, B, C)
- Howell Warehouses Ltd., Toronto, Ont. (A, B, D, E)
- Hunt, Harry E., Co., Scarboro, Ont. (A, E)
- Strong Cobb Arner of Canada, Ltd., Fort Erie, Ont. (A, B, E)

MEXICO

- Tecpak, S. A., Mexico, D. F. (A, B, D, E)

CONVERTERS OF FILMS

(Plastics & Cellophane)

Editorial information, Div. 1 Sec. 4

- ABC Cellophane Co., Div. Rapid Container Corp., Brooklyn, N. Y.
- •Acme Backing Corp., Stamford, Conn.
- Acme Tag Co., Minneapolis
- ADhere Corp., Cincinnati
- Aladdin Transparent Packaging Corp., Westbury, N. Y.
- American Industries Co., Div. American Shredded Paper Co., Boston
- American Kleer-Vu Plastics, Inc., New York
- Arkell & Smiths, Hudson Falls, N. Y.
- Artmor Plastics Corp., Cumberland, Md.
- Atlanta Film Converting Co., Atlanta, Ga.
- Bagcraft Corp. of America, Chicago
- Beacon Paper Bag Co., E. Paterson, N. J.
- Bellen Co., Chicago
- Ben-Mont, The Dow Chemical Co., Dobeckmun Div., Bennington, Vt.
- Blank, Arthur, & Co., Boston
- Blossom Mfg. Co., Brooklyn, N. Y.
- Boyertown Packaging Service Corp., Boyertown, Pa.
- Bro-Dart Industries, Newark, N. J.
- Brooks Paper Co., St. Louis, Mo.
- COSECO, Los Angeles
- Cadillac Products, Inc., Warren, Mich.
- Cal-Plastics, San Francisco
- Canton Containers, Inc., Canton, Ohio
- Catty, H. D., Corp. of New York, Norwalk, Conn.
- Cello Bag Co., Seattle, Wash.
- Cello-Pack, Inc., Buffalo, N. Y.
- •Cellu-Craft Products Corp., New Hyde Park, N. Y.
- Central States Paper & Bag Co., St. Louis, Mo.
- Chicago Carton Co., Div. Waldorf Paper Products Co., Chicago
- Clear View Bag Co., Carmel, Ind.
- Coating Products, Inc., Englewood, N. J.
- Colorcraft Products, Inc., Bridgeport, Conn.
- Crown Zellerbach Corp., Western-Waxide Div., San Leandro, Calif.
- Crystal Tube Corp., Chicago
- Crystal-X Corp., Lenni Mills, Pa.
- Custom Merchandise Corp., Brooklyn, N. Y.
- Custom-Made Paper Bag Co., Long Island City, N. Y.
- Daniels Mfg. Co., Rhinelander, Wis.
- Deluxe Packages, Inc., South Gate, Calif.
- Diaphane Corp., Philadelphia
- •Dobeckmun Co., Div. Dow Chemical Co., Cleveland
- Dura-Lee Corp., Kansas City, Kan.
- Durapak Mfg. Co., Baltimore, Md.
- Equitable Paper Bag Co., Long Island City, N. Y.
- Excelsior Transparent Bag Mfg. Co., Yonkers, N. Y.
- Fabricon Products, River Rouge, Mich.
- Facile Corp., Sub. Sun Chemical Corp., Paterson, N. J.
- Flexible Packing, Inc., Oceanside, N. Y.
- Flexicraft Industries, Inc., New York
- Formed Container Corp., Sub. Phillips Petroleum Co., Orangeburg, N. Y.
- General Films, Inc., Covington, Ohio
- Gering Plastics, Kenilworth, N. J.
- Gordon-Lacey Chemical Prodoucts Co., Maspeth, N. Y.
- H & R Plastics Industries, Inc., Nazareth, Pa.
- Henschel, C. B., Mfg. Co., Milwaukee
- House of More, San Francisco
- Hurwich, R., Co., Berkeley, Calif.
- Hy-Sil Mfg. Co., Revere, Mass.
- Kage Co., Manchester, Conn.
- Kehr Products Co., Willow Grove, Pa.
- Kellogg Container Div., United States Envelope Co., Springfield, Mass.
- Kleartone Transparent Products Co., Westbury, N. Y.
- Kleerpak Mfg. Co., No. Hollywood, Calif.
- •Kordite Co., Div. National Distillers & Chemical Corp., Macedon, N. Y.
- Lamart Corp., Clifton, N. J.
- Lamex, Inc., Norcross, Ga.
- •Lassiter, Div. Riegel Paper Corp., New York
- Leedpak, Inc., New York
- Lepak Co., Long Island City, N. Y.
- Long, Bert, Contract Packers, Lancaster, Pa.
- Lucas Sales Co., Oklahoma City, Okla.
- •Ludlow Corp., Needham Heights, Mass.
- M & D Flexographic Printers, Inc., Chicago
- Magid-Robinson Co., New York
- Mason Transparent Package Co., Div. Mason Envelope Co., New York
- Master Packaging, Inc., Tampa, Fla.
- •Mehl Mfg. Co., Cincinnati
- Melrose Packaging Corp., Flushing, N. Y.
- Mil-Jan Bag Co., Muskegon, Mich.
- Millar, Geo. W., & Co., New York
- •Milprint, Inc., Milwaukee
- Modern Packaging, Inc., Mt. Holly, N. J.
- Modern Transparent Mfg. Co., W. Pittston, Pa.
- Munson Bag Co., Cleveland
- •Nashua Corp., Nashua, N. H.
- New Jersey Transparent Co., Brooklyn, N. Y.
- New York Packaging Corp., Brooklyn, N. Y.
- Newark Paraffine Paper Co., Newark, N. J.
- •Nichols Paper Products Co., Green Bay, Wis.
- Northwestern Paper Box Co., Seattle, Wash.
- •Oneida Paper Products, Inc., Clifton, N. J.
- Pac-Craft, Inc., Miami, Fla.
- Pacific Process Printing Co., Los Angeles
- Package Engineers, Inc., Oklahoma City, Okla.
- Package Printing Co., W. Springfield, Mass.
- Package Products Co., Charlotte, N. C.
- Packageers Co., Chicago
- Packaging Pioneers, Inc., Tuckahoe, N. Y.
- Packaging Products, Inc., Kansas City, Mo.
- Packet Research Corp., Boston
- Pexco Bag Mfg. Co., Toledo, Ohio
- •Plastic Packaging Co., Chicago
- Poly Plastic Products, Inc., Paterson, N. J.
- Polyfab Co., Los Angeles
- Premier Packages, Inc., St. Louis, Mo.
- Prepac, Inc., New York
- Protective Coatings Corp., Clifton, N. J.
- •Protective Lining Corp., Brooklyn, N. Y.
- Puritan Packaging Corp., Columbus, Ohio
- Quatrum Corp., Chicago
- •Queen Transparent Specialties Co., Chicago
- Rap Industries, Inc., Minneapolis
- Rapid-Pak, Inc., Los Angeles
- Resnick, L., & Sons, Philadelphia
- Richmond Paper Co., Highland, Calif.
- •Riegel Paper Corp., New York
- Roll-O-Sheets, Inc., St. Louis, Mo.
- Rollprint Products Corp., Chicago
- Rose Hill Lithographers, Inc., New York
- Ross & Roberts, Inc., Stratford, Conn.
- Safelon Corp., Yonkers, N. Y.
- Saniwax Paper Co., Kalamazoo, Mich.
- Schenker Co., Chicago
- Shore Line Industries, Inc., Clinton, Conn.
- Somerville Ltd., London, Ont.
- Speedmaster Packaging Corp., New York
- Standard Insulation Co., E. Rutherford, N. J.
- •Standard Packaging Corp., New York
- Strauss, H. B., Corp., New York
- Tecpak, S. A., Mexico, D. F., Mexico
- Tee-Pak, Inc., Chicago
- Texas Plastics, Inc., Elsa, Texas
- •Thilmany Pulp & Paper Co., Kaukauna, Wis.
- Trans Flex Packagers, Inc., Unionville, Conn.

Tripp Tape, Inc., Skokie, Ill.
Tubophane S.A., Paris, France
Twitchell, E. W., Inc., Packaging Div., Philadelphia
VanPak Products, Inc., Tomah, Wis.
Vernon Chemical & Mfg. Corp., New York
Vizuall Co., New York
W.E.W. Container Co., Brooklyn, N. Y.
Ward & Douglass, Chatham, N. J.
Weaver Packaging Co., Montrose, Calif.
Webster Industries, Inc., Salem, Mass.
Wrapture, Inc., Flushing, N. Y.

CONVERTERS OF RIGID PLASTIC SHEET

Editorial information, Div. II Sec. 8

American Paper Box Co., Montreal, Que.
Artmor Plastics Corp., Cumberland, Md.
Blank, Arthur, & Co., Boston
Bro-Dart Industries, Newark, N. J.
Cadillac Plastic & Chemical Co., Detroit
Cal-Plastics, San Francisco
Central States Paper & Bag Co., St. Louis, Mo.
Chanal Plastics Corp., Rego Park, N. Y.
Chicago Paper Box Co., Chicago
Clear-Vu Packaging Corp., New York
•Contour Extrusion Co., Mamaroneck, N. Y.
Crook, William A., Co., Watertown, Mass.
Crystal-X Corp., Lenni Mills, Pa.
Custom Merchandise Corp., Brooklyn, N. Y.
DeWitt Plastics, Auburn, N. Y.
Eastern Vacuum Forming Co., Asbury Park, N. J.
Fabri-Kal Corp., Kalamazoo, Mich.
Feder Industries, Inc., New York
Formed Container Corp., Sub. Phillips Petroleum Co., Orangeburg, N. Y.
•Gardner Div., Diamond National Corp., Middletown, Ohio
General Plastics Corp., Bloomfield, N. J.
Heidi Plastics Corp., Yonkers, N. Y.
Leedpak, Inc., New York
Loma Industries, Inc., Fort Worth, Texas
Lone Star Plastics Co., Fort Worth, Texas
Madan Plastics, Inc., Cranford, N. J.
Mankato Plastic Co., Mankato, Minn.
Martin, Fair, Boxes, Inc., Concord, N. C.
Millar, Geo. W., & Co., New York
•Nashua Corp., Nashua, N. H.
Package Printing Co., W. Springfield, Mass.
•Plastic Artisans, Inc., Port Chester, N. Y.
Prepac, Inc., New York
Service Engineers, Inc., Fort Worth, Texas
Shore Line Industries, Inc., Clinton, Conn.
Sillcocks Miller Co., Maplewood, N. J.
Superior Plastics, Inc., Chicago
Syracuse Plastics, Inc., Syracuse, N. Y.
T. O. Plastics, Inc., Minneapolis
Thermo-Plastic Products Co., San Carlos, Calif.
Tubed Chemicals Corp., Easthampton, Mass.
Unger Laminating Co., Brooklyn, N. Y.
Vacuum Plastics Corp., Columbus, Ohio
Valley-National Corp., Milldale, Conn.
Ward & Douglass, Chatham, N. J.
Weaver Packaging Co., Montrose, Calif.
Weinman Brothers, Inc., Chicago
Westlake Plastics Co., Lenni Mills, Pa.
Wrapture, Inc., Flushing, N. Y.

CYLINDER ENGRAVING

Editorial information, Div. IV Sec. 15

Acme Gravure Services, Inc., Rolling Meadows, Ill.
Beck Engraving Co., Philadelphia
Chambers-Storck Co., Norwich, Conn.
•Consolidated Engravers Div., American-Marietta Co., Charlotte, N. C.
Gravure Cylinder Corp., Hoboken, N. J.
•Intaglio Service Corp., New York
•Inta-Roto Machine Co., Richmond, Va.
Pamarco, Inc., Roselle, N. J.
Roller Engraving Co., Long Island City, N. Y.
•Roto Cylinders, Inc., Palmyra, N. J.
Rotogravure Service Co., Chicago
Southern Gravure Service, Inc., Louisville, Ky.
Yoder Engraving Co., Middletown, Ohio

DECORATING, CUSTOM, ON GLASS, PLASTICS & CERAMICS

A. Etching
B. Hot Stamping
C. Printing
D. Silk Screening
E. Spraying

Editorial information, Div. II Sec. 8, 10, Div. IV Sec. 15

Ameriplastic Co., Flint, Mich. (A, B, C, D, E)
Amos Molded Plastics, Edinburg, Ind. (B, C, D, E)
Anigraphic Decorators, Inc., Cliffside Park, N. J. (B, C, D, E)
Art Decorating Co., No. Bergen, N. J. (B, C, D)
Averil, Inc., Miami, Fla. (D)
•Bon-R Reproductions, Inc., New York (D)
Braun, W., Co., Chicago (D, E)
Busch, V. W., Mfg. Co., So. Lyon, Mich. (D)
Carr-Lowrey Glass Co., Baltimore, Md. (D, E)
Ceragraphic, Inc., Hackensack, N. J. (D, E)
Ceramic Decorating Co., Los Angeles (B, D, E)
Cincinnati Container Co., Cincinnati (D)
•Colonial Applicator Co., Vineland, N. J. (B, D)
Crook, William A., Co., Watertown, Mass. (B, D)
•Dougherty Brothers, Buena, N. J. (B, C, D, E)
•Erno Products Co., Philadelphia (C, D)
Fabri-Kal Corp., Kalamazoo, Mich. (B, C, D, E)
Flock Process Co., Norwalk, Conn. (D, E)
Gotham Plastics Co., Bronx, N. Y. (B, D, E)
Henschel, C. B., Mfg. Co., Milwaukee (B)
Highland Printers & Plastic Molders, Pasadena, Calif. (C)
Howard Plastics Co., Leominster, Mass. (B)
Long, Bert, Contract Packers, Lancaster, Pa. (B, D)
Lustra-Cite Industries, Inc., Brooklyn, N. Y. (B, D, E)
Masta Displays, Inc., New York (D)
McKay Chemical Co., Brooklyn, N. Y. (A, D, E)
Metal Fabrications, Inc., Waterbury, Conn. (B, C, D, E)
Monaplastics, Inc., Georgetown, Conn. (B, C, D)
Monroe-Danford & Co., Weehawken, N. J. (D, E)
Morningstar Corp., Cambridge, Mass. (B, C, E)
Olympic Plastics Co., Los Angeles (B, C, D, E)
Permanent Label Corp., Bloomfield, N. J. (B, C, D, E)
Planned Displays, Inc., Leominster, Mass. (D, E)
Plastic Art Metallizing Corp., Brooklyn, N. Y. (B, D)
Plastic Inlays, Inc., Summit, N. J. (B, D, E)
Printloid, Inc., Long Island City, N. Y. (B, C, D)
•Products Packaging, Inc., Cleveland (B, D)
Seri-Print, Inc., Waterbury, Conn. (B, C, D, E)
Sierad, Albert E., Co., Mamaroneck, N. Y. (E)
Sillcocks Miller Co., Maplewood, N. J. (A, B, C, D, E)
Sonorol Laboratories, New York (C)
Superior Plastics, Inc., Chicago (B, D, E)
Vacuum Plastics Corp., Columbus, Ohio (D, E)

DESIGNERS

(See Package Designers)

DISPLAY MOUNTING & FINISHING

Editorial information, Div. IV Sec. 15

Abest Paper Box Co., New York
Abt Lithographers, Inc., Branford, Conn.
American Die & Box Co., Denver, Colo.
Arvey Corp., Chicago
Bestcraft Products Co., New York
Box Shop, Inc., New Haven, Conn.
Burton Packaging Co., Brooklyn, N. Y.
Casco Paper Box Co., Portland, Maine
Chanal Plastics Corp., Rego Park, N. Y.
•Chaspec Mfg. Co., Greenwich, Conn.
Contour Packaging Co., Philadelphia
Display Finishing Co., Long Island City, N. Y.
Dyment Co., Cleveland
•Dyn Corp., Cliffside Park, N. J.
Eagle Paper Box Mfg. Co., Chicago
Einson-Freeman Co., Long Island City, N. Y.
Essex Paper Box Mfg. Co., Newark, N. J.
Freedman Die Cutters, Inc., New York
Friedel, J. F., Paper Box Co., E. Syracuse, N. Y.
Lansky Die Cutting Corp., Brooklyn, N. Y.
Leominster Paper Box Co., Leominster, Mass.
Lithographers' Finishing Co., New York
Nesbit Industries, Inc., Chicago
Planned Displays, Inc., Leominster, Mass.
Regent Specialties, Div. Angle Geneseo Corp., Rochester
Romar "Skin-Pack," Inc., Brooklyn, N. Y.
Shadur Box Co., Milwaukee
Shear-Prinz Associates, Chicago
Sillcocks Miller Co., Maplewood, N. J.
Superior Plastics, Inc., Chicago
Wells Badger Corp., Milwaukee
York Display Finishing Co., Brooklyn, N. Y.

ENGINEERING CONSULTANTS

A. Machinery and/or Systems
B. Packaging
C. Shipping

Arens, Egmont, Industrial Design, New York (B)
Arnkurt Associates, Inc., New York (B, C)
Associated Industrial Designers, Div. Design for Selling, Inc., New York (A, B, C)
Barkley & Dexter, Inc., Fitchburg, Mass. (A, B, C)
Bauer, Robert E., Co., Flourtown, Pa. (A, B)
Blonder, Howard, & Associates, Downey, Calif. (A, B)
Chinkes, Sam & Assoc., New York (B)
Container Laboratories, Inc., Chicago (A, B, C)
Corrugated Adhesive & Combiner Consultants, Inc., New Brunswick, N. J. (A)
Dailey, Don, & Associates, Evansville, Ind. (B)
Dalsemer, Gordon H., Baltimore (A)
DeBell & Richardson, Inc., Hazardville, Conn. (A, B)
Design Dynamics, Inc., Northfield, Ill. (A, B)
Designers for Industry, Inc., Cleveland (A, B)
Dresden, Mark K., Media, Pa. (B)
Fink, Karl, & Associates, New York (B)
Flotepak Corp., Southfield, Mich. (B, C)
Gambon, Thomas F., Associates, St. Louis, Mo. (A, B)
Gaynes Engineering Co., Chicago (A, B, C)
Gerow, Inc., Pine Brook, N. J. (A)
Green, Frank W., Co., E. Longmeadow, Mass. (A, B, C)
Hayes, John S., Wantagh, N. Y. (B)
Huff, M., & Co., Newark, N. J. (B)
Inpak Systems, Inc., New York (A, B)
Keck, Henry, Associates, So. Pasadena, Calif. (A, B)
Ketchpel Engineering Co., W. Englewood, N. J. (A)
Landis, Ellis M., Havertown, Pa. (A)
•Lee Associates, Wellesley Hills, Mass. (A, B)
Levey, Harold A., Laboratories, New Orleans, La. (A)
Lewis, Stephen J., Engineering Co., Brooklyn, N. Y. (A)
Little, Arthur D., Inc., Cambridge, Mass. (A, B, C)
Magill, D. G., Great Neck, N. Y. (A, B)
Main, Chas. T., Inc., Boston (A, B, C)
Moravec, L. A., Woodland Hills, Calif. (A)
Packaging Consultants, Inc., Washington, D. C. (A, B, C)
Perina, Frank A., Jr., Union, N. J. (B, C)
Prodigo, Edward F., Inc., Tenafly, N. J. (A, B, C)
Scheele, Edwin H., Woodside, N. Y. (B)
Schladermundt, Peter, Associates, New York (A, B)
Sensory, Inc., Morristown, N. J. (A)
Sloan, Francis J., Springfield, Mass. (A, B)
Southwick, Charles A., Jr., Hope, N. J. (B)
•Stone, Orie, Associates, Valley Cottage, N. Y. (A, B, C)
Toensmeier, Patrick A., & Associates, Hamden, Conn. (A, B, C)
Wainess, Harold, & Associates, Chicago (A, B)
Wells, George E., Inc., St. Louis, Mo. (A)
Worden, Edwin S., & Associates, Westport, Conn. (A, B, C)
Young, William E., & Co., Little Falls, N. J. (A, B)
Zackheim, Eli A., Princeton, N. J. (B, C)
Zusi, Charles J., Evanston, Ill. (B, C)

FINISHING & COATING, CUSTOM
(Lacquers & Varnishes)

Editorial information, Div. I Sec. 3

Abt Lithographers, Inc., Branford, Conn.
Ackermann, G. A., Printing Co., Cicero, Ill.
Acro Chemical Products Corp., Long Valley, N. J.
Blossom Mfg. Co., Brooklyn, N. Y.
•Cincinnati Box & Partition Co., Cincinnati
Coating Products, Inc., Englewood, N. J.
Contour Packaging Co., Philadelphia
•Crawford, John W., Co., New York
Dejonge, Louis, & Co., New York
Dyment Co., Cleveland
Eronel Services, Inc., New Milford, Conn.
Farrington Texol Corp., Walpole, Mass.
Flock Process Co., Norwalk, Conn.
Franklin Folding Box Co., Chicago
General Plastics Corp., Bloomfield, N. J.
Girder Process, Inc., Hackensack, N. J.
Hampton Mfg. Co., Industrial Tape Div., New Rochelle, N. Y.
Henschel, C. B., Mfg. Co., Milwaukee
•Lassiter, Div. Riegel Paper Corp., New York
Leominster Paper Box Co., Leominster, Mass.
Lithographers' Finishing Co., New York
•Ludlow Corp., Needham Heights, Mass.
Mankato Paper Box Co., Mankato, Minn.
Metal Fabrications, Inc., Waterbury, Conn.
Monroe-Danford & Co., Weehawken, N. J.
Nevins Co., Clifton, N. J.
Orchard Paper Co., St. Louis, Mo.
Planned Displays, Leominster, Mass.
Printloid, Inc., Long Island City, N. Y.
Pyrotex Co., Leominster, Mass.
Pyroxylin Products, Inc., Chicago
Rochester Lithograph Mfg. Corp., Rochester, N. Y.
Rollprint Products Corp., Chicago
Ross & Roberts, Inc., Stratford, Conn.
St. Regis Paper Co., New York
Scovill Mfg. Co., Waterbury, Conn.
Seri-Print, Inc., Waterbury, Conn.
Shopsin Paper Co., New York
Sierad, Albert E., Co., Mamaroneck, N. Y.
Sillcocks Miller Co., Maplewood, N. J.
Solatech Coating Corp., New Rochelle, N. Y.
Standard Insulation Co., E. Rutherford, N. J.
•Standard Packaging Corp., General Felt Products Div., Brooklyn, N. Y.
•Sterling Seal Co., Erie, Pa.
Vis-A-Pak Mfg. Corp., New York
Western Foil Converters, Inc., Berkeley, Calif.
Wrapture, Inc., Flushing, N. Y.
Zumbiel, C. W., Co., Cincinnati

FLOCKING

Editorial information, Div. I Sec. 3

Ameriplastic Co., Flint, Mich.
Bestcraft Products Co., New York
•Chaspec Mfg. Co., Greenwich, Conn.
Facile Corp., Sub. Sun Chemical Corp., Paterson, N. J.
Feder Industries, Inc., New York
Flock Process Co., Norwalk, Conn.
Long, Bert, Contract Packers, Lancaster, Pa.
Marquardt & Co., New York
Microfibres, Inc., Pawtucket, R. I.
•Nashua Corp., Nashua, N. H.
Strauss, H. B., Corp., New York
Synthon, Inc., Cambridge, Mass.
Ve-Alite Plastic Corp., Brooklyn, N. Y.

LABORATORIES, RESEARCH & TESTING

Editorial information, Div. I Sec. 2

Battelle Memorial Institute, Columbus, Ohio
Bjorksten Research Laboratories, Madison, Wis.
Center for Research in Marketing, Inc., Peekskill, N. Y.
Color Research Institute, Chicago
Container Laboratories, Inc., Chicago
DeBell & Richardson, Inc., Hazardville, Conn.
Design Performance Laboratories, New York
Designers for Industry, Inc., Cleveland
Detroit Testing Laboratory, Inc., Detroit
Food & Drug Research Laboratories, Inc., Maspeth, N. Y.
Gaynes Engineering Co., Chicago
Huff, M., & Co., Newark, N. J.
Industrial Testing Service, Div. American BioChemical Laboratory, Baltimore, Md.
LaWall & Harrisson Research Laboratories, Philadelphia
Levey, Harold A., Laboratories, New Orleans, La.
Little, Arthur D., Inc., Cambridge, Mass.
Midwest Testing Laboratories, Chicago
National Family Opinion, Inc., Toledo, Ohio
Package Development Corp., Milwaukee
Radiation Applications, Inc., Long Island City, N. Y.
•Snell, Foster D., Inc., New York
Sorel, Frederick, Prospect Heights, Ill.
United States Testing Co., Hoboken, N. J.

LAMINATING, CUSTOM

Editorial information, Div. I Sec. 4

•Acme Backing Corp., Stamford, Conn.
American Die & Box Co., Denver, Colo.
Andre Paper Box Co., San Leandro, Calif.
Anigraphic Decorators, Inc., Cliffside Park, N. J.
Arvey Corp., Chicago
Badger Carton Co., Milwaukee
Ben-Mont, The Dow Chemical Co., Dobeckmun Div., Bennington, Vt.
Bestcraft Products Co., New York
Blank, Arthur, & Co., Boston
Blossom Mfg. Co., Brooklyn, N. Y.
Boyertown Packaging Service Corp., Boyertown, Pa.
Butterfield-Barry Co., Teterboro, N. J.
Cahill, J. D., Co., Hampton, N. H.
Canton Containers, Inc., Canton, Ohio
Cello Bag Co., Seattle, Wash.
•Cellu-Craft Products Corp., New Hyde Park, N. Y.
Coating Products, Inc., Englewood, N. J.
Crown Zellerbach Corp., Western-Waxide Div., San Leandro, Calif.
Dejonge, Louis, & Co., New York

Addresses of companies listed appear on pp. 808-847

•Dobeckmun Co., Div. Dow Chemical Co., Cleveland
Emeloid Co., Sub. Addressograph-Multigraph Corp., Hillside, N. J.
Exeter Paper Co., Chicago
Facile Corp., Sub. Sun Chemical Corp., Paterson, N. J.
Fasson Products, Div. Avery Adhesive Products, Inc., Painesville, Ohio
Fuller Displays, Inc., Long Island City, N. Y.
General Plastics Corp., Bloomfield, N. J.
Girder Process, Inc., Hackensack, N. J.
Harco Industries, Inc., Rochester, N. Y.
Henschel, C. B., Mfg. Co., Milwaukee
Hopp Plastics, New York
Labelon Corp., Canandaigua, N. Y.
Lamart Corp., Clifton, N. J.
Laminated Paper Products, Santa Clara, Calif.
Leedpak, Inc., New York
Leominster Paper Box Co., Leominster, Mass.
Lithographers' Finishing Co., New York
•Ludlow Corp., Needham Heights, Mass.
M & Q Plastic Products, Freehold, N. J.
Magid-Robinson Co., New York
Marvellum Co., Holyoke, Mass.
Mead Board Sales, Inc., Cincinnati
Melrose Packaging Corp., Flushing, N. Y.
•Milprint, Inc., Milwaukee
Modern Packaging, Inc., Mt. Holly, N. J.
National Foil Co., Elizabeth, N. J.
Newark Paraffine Paper Co., Newark, N. J.
•Nichols Paper Products Co., Green Bay, Wis.
•Oneida Paper Products, Inc., Clifton, N. J.
Paperboard Laminating Corp., Norwalk, Conn.
Planned Displays, Leominster, Mass.
Potlatch Forests, Inc., Lewiston, Idaho
Printloid, Inc., Long Island City, N. Y.
Protective Coatings Corp., Clifton, N. J.
Protexall Permanent Process Service, Kansas City, Mo.
Rap Industries, Inc., Minneapolis
Revere Copper & Brass, Inc., New York
•Riegel Paper Corp., New York
Ross & Roberts, Inc., Stratford, Conn.
St. Regis Paper Co., New York
Salwen, Joe, Paper Products Corp., Brooklyn, N. Y.
Salwen Paper Co., Brooklyn, N. Y.
San Jose Paper Box Co., Santa Clara, Calif.
Shopsin Paper Co., New York
Sillcocks Miller Co., Maplewood, N. J.
•Smith, H. P., Paper Co., Chicago
Southern Special Products, Richmond, Va.
Standard Insulation Co., E. Rutherford, N. J.
•Standard Packaging Corp., New York
Sweetnam, George H., Inc., Cambridge, Mass.
•Thilmany Pulp & Paper Co., Kaukauna, Wis.
Unger Laminating Co., Brooklyn, N. Y.
Ve-Alite Plastic Corp., Brooklyn, N. Y.
Virginia Laminating Co., Amelia, Va.
Western Foil Converters, Inc., Berkeley, Calif.
Zumbiel, C. W., Co., Cincinnati

LITHOGRAPHERS, METAL

Editorial information, Div. II Sec. 9, Div. IV Sec. 15

Daher Co., Long Island City, N. Y.
Dale, John, Ltd., London, England
•Reynolds Metals Co., Richmond, Va.

LITHOGRAPHERS, PAPER

Editorial information, Div. IV Sec. 15. 16

Abt Lithographers, Inc., Branford, Conn.
Ackermann, G. A., Printing Co., Cicero, Ill.
Brandau Craig Dickerson Co., Nashville, Tenn.
Brett Lithographing Co., Long Island City, N. Y.
Bro-Dart Industries, Newark, N. J.
Brooks & Porter, Inc., New York
Butler & Ferrigno Lithographic Co., Philadelphia
Castle Offset Printing Corp., Norwalk, Ohio
Chicago Carton Co., Div. Waldorf Paper Products Co., Chicago
Chopp Printing Specialties, Inc., New York
Color Craft Display Corp., Long Island City, N. Y.
Consolidated Lithographing Corp., Carle Place, N. Y.
Einson-Freeman Co., Long Island City, N. Y.
Eureka Specialty Printing Co., Scranton, Pa.
Fuller Displays, Inc., Long Island City, N. Y.
Gamse Lithographing Co., Baltimore, Md.
Gardner-Brooks, Inc., Sub. Diamond National Corp., Springfield, Mass.
Geuder Paeschke & Frey Co., Milwaukee
Gleason Industries, El Segundo, Calif.
Hopp Plastics, New York
•Howell, F. M., & Co., Elmira, N. Y.
Industrial Lithographic Co., Brooklyn, N. Y.
Inland Lithograph Co., Chicago
•Jackmeyer Corp., New York
Kaumagraph Co., Wilmington, Del.
•Lassiter, Div. Riegel Paper Corp., New York
Lawson & Jones Ltd., London, Ont.
Leedpak, Inc., New York
Lord Baltimore Press, Inc., New York
Lutz & Sheinkman, New York
Meehan Tooker Co., New York
Mendola Bros., Inc., New Orleans, La.
•Milprint, Inc., Milwaukee
Nielsen Lithographing Co., Cincinnati
Package Products Co., Charlotte, N. C.
Parrot Litho A/S, Copenhagen, Denmark
Penn Lithographing Co., Philadelphia
Philipp Lithographing Co., Grafton, Wis.
Progress Lithographing Co., Cincinnati
Rhoades Paper Box Corp., Springfield, Ohio
•Riegel Paper Corp., New York
Rochester Lithograph Mfg. Corp., Rochester, N. Y.
Rollprint Products Corp., Chicago
Rose Hill Lithographers, Inc., New York
Rossotti Lithograph Corp., No. Bergen, N. J.
Schmidt Lithograph Co., San Francisco
Sillcocks Miller Co., Maplewood, N. J.
Somerville Ltd., London, Ont.
•Standard Packaging Corp., New York
Stecher-Traung Lithograph Corp., Rochester, N. Y.
•Sterling Seal Co., Erie, Pa.
Trautmann, Bailey & Blampey, New York
•United States Printing & Lithograph, Div. Diamond National Corp., New York
Veritone Co., Melrose Park, Ill.
Weil's, David, Sons Lithographic Co., Brooklyn, N. Y.
Wright Lithographing Co., New York
Zuckerman, Joseph, Inc., Yonkers, N. Y.

MOLDERS, FOAMED PLASTICS

Editorial information, Div. II Sec. 8

Air-O-Plastik Corp., Union City, N. J.
Arkell Safety Bag Co., New York
Artmor Plastics Corp., Cumberland, Md.
Arvey Corp., Chicago
Bishop, Robert B., Inc., Chicago
Bruce Molded Plastic Products, Inc., Pittsburgh
Burkart, F., Mfg. Co., St. Louis, Mo.
Crown Machine & Tool Co., Fort Worth, Texas
Denver Plastics, Inc., Golden, Colo.
Duval Industries, Inc., Winthrop, Mass.
Expandex Corp., Wauregan, Conn.
Flambeau Plastics Corp., Baraboo, Wis.
Foam Fabricators, Inc., St. Louis, Mo.
Foam Plastics, Inc., Cambridge Springs, Pa.
Frabill Mfg. Co., Milwaukee
Frank Plastics Corp., Detroit
General Box Co., Des Plaines, Ill.
General Foam Corp., New York
General Foam Plastics Corp., Portsmouth, Va.
Glo-Brite Foam Plastics, Inc., Chicago
Hermsdorf Industries, Inc., Manchester, N. H.
Ideal Fishing Float Co., Richmond, Va.
Illinois Plastic Molding & Mfg., Chicago
Kresge Paper Box Co., Bethlehem, Pa.
Loma Industries, Inc., Fort Worth, Texas
Lone Star Plastics Co., Fort Worth, Texas
Madan Plastics, Inc., Cranford, N. J.
Nash-Hammond, Inc., El Monte, Calif.
Nesbit Industries, Inc., Chicago
Nopco Chemical Co., Plastics Div., No. Arlington, N. J.
•Owens-Illinois Glass Co., Toledo, Ohio
•Packaging Components, Inc., New York
•Packaging Corp of America, Evanston, Ill.
•Plas-Tech, Inc., St. Paul, Minn.
Plastic Parts Corp., Toledo, Ohio
Plasti-Vue Mfg. Co., Fort Worth, Texas
Pulp Reproduction Co., Milwaukee
Standard Molding Corp., Dayton, Ohio
Standard Plastics, Inc., Fogelsville, Pa.
T. O. Plastics, Inc., Minneapolis
Technifoam Corp., New York
Techniform, Inc., Van Nuys, Calif.
Thomas Plastikraft Corp., New Hartford, N. Y.
Twinpak Ltd., Lachine, Que.
United Progress, Inc., Albany, N. Y.
Ward & Douglass, Chatham, N. J.
•Weber Plastics, Inc., Stevens Point, Wis.

MOLDERS, PLASTICS

Editorial information, Div. II Sec. 8

Air Formed Products Corp., Sub. Bemis Bros. Bag Co., Nashua, N. H.
Ajax Comb Co., Div. Vulcanized Rubber & Plastics Co., Morrisville, Pa.
Alfa Mfg. Co., Chicago
Alladin Plastics, Inc., Gardena, Calif.
American Cellular Corp., Miami, Fla.
Ameriplastic Co., Flint, Mich.
Amos Molded Plastics, Edinburg, Ind.
•Anchor Hocking Glass Corp., Lancaster, Ohio
Andover Industries, Inc., Div. Erie Resistor Corp., Andover, Ohio
•Animal Trap Co. of America, Lititz, Pa.
Apcon Co., Independence, Mo.
Arrow Mfg. Co., West New York, N. J.
Bel-Art Products, Pequannock, N. J.

Bonny Mfg. Corp., Maynard, Mass.
Boonton Molding Corp., Boonton, N. J.
Bopp-Decker Plastics, Inc., Birmingham, Mich.
Braun-Crystal Mfg. Co., Middle Village, N. Y.
Braun, W., Co., Chicago
Brilhart Plastics Corp., Mineola, N. Y.
Bruce Molded Plastic Products, Inc., Pittsburgh
Bud-Wil Industries, Lynwood, Calif.
Cameron, Inc., Chicago
•Celluplastics, Inc., Sub. Brockway Glass Co., Newark, N. J.
Chanal Plastics Corp., Rego Park, N. Y.
Chicago Molded Products Corp., Chicago
Cimastra Div., The Cincinnati Milling Machine Co., Cincinnati
Cincinnati Molding Co., Cincinnati
Columbia Basin Plastics Co., No. Hollywood, Calif.
Conart Co., Glen Head, N. Y.
Continental Plastics Corp., Chicago
Continental Plastics of Oklahoma, Oklahoma City, Okla.
Contour Packaging Co., Philadelphia
•Creative Packaging, Inc., Indianapolis
Creative Plastic Containers, Culver City, Calif.
Crown Machine & Tool Co., Fort Worth, Texas
Dale, John, Ltd., London, England
Danielson Mfg. Co., Danielson, Conn.
Delkay Plastics Corp., Gardena, Calif.
Denver Plastics, Inc., Golden, Colo.
DeWitt Plastics, Auburn, N. Y.
•Diamond Plastics Industries, Div. Creative Packaging, Inc., Roanoke, Va.
•Dillon-Beck Mfg. Co., Hillside, N. J.
•Dougherty Brothers, Buena, N. J.
DuBois Plastic Products, Inc., Buffalo, N. Y.
Elgin Co., New York
Emeloid Co., Sub. Addressograph-Multigraph Corp., Hillside, N. J.
Fedco Corp., Chicago
Ferriot Bros., Inc., Akron, Ohio
Flambeau Plastics Corp., Baraboo, Wis.
•Flex Products Corp., Rutherford, N. J.
Frank Plastics Corp., Detroit
•Frank, Walter, Organization, Hillside, Ill.
Garray Plastics, Inc., Kearny, N. J.
Gary Enterprises, Inc., Brooklyn, N. Y.
Gibbs Automatic Moulding Div., Pierce Industries, Inc., Henderson, Ky.
Guild Molders, Inc., Elmsford, N. Y.
H & R Plastics Industries, Inc., Nazareth, Pa.
Holstein, Lee, Injection Molding, Inc., Clifton, N. J.
Howard Plastics Co., Leominster, Mass.
Injection Molding Corp., New York
Keolyn Plastics, Inc., Chicago
Koller Craft Plastic Products, Inc., Fenton, Mo.
Kusan, Inc., Nashville, Tenn.
Landsberger Plastics Co., New York
Lewis, G. B., Co., Watertown, Wis.
Loma Industries, Inc., Fort Worth, Texas
Lone Star Plastics Co., Fort Worth, Texas
Lumelite Corp., Pawling, N. Y.
M & Q Plastic Products, Freehold, N. J.
Madan Plastics, Inc., Cranford, N. J.
Michigan Industrial Packaging, Inc., Grand Rapids, Mich.
Monaplastics, Inc., Georgetown, Conn.
Monroe-Danford & Co., Weehawken, N. J.
Morningstar Corp., Cambridge, Mass.
Mutual Plastic Mold Corp., South Gate, Calif.
Nalle Plastics, Inc., Austin, Texas
North Star Industries, Inc., Minneapolis
Nosco Plastics, Inc., Erie, Pa.
Olympic Plastics Co., Los Angeles
Oppenheim Co., New York
•Owens-Illinois Glass Co., Toledo, Ohio
Parker Kalon Div., General American Transportation Corp., Clifton, N. J.
Peoria Plastics Co., E. Peoria, Ill.
PharmaPlastics, Inc., Baltimore, Md.
Pittsburgh Plastics Div., Heekin Can Co., New Castle, Pa.
Plastene Corp., Crawfordsville, Ind.
Plastic Assembled Products, Inc., Baltimore, Md.
Plastic Molded Products Co., Chicago
Plastican Corp., Butler, N. J.
Plasticite Corp., Bronx, N. Y.
Plasticon Corp., Minneapolis
Plasti-Pak Containers Ltd., Toronto, Ont.
Plasti-Vue Mfg. Co., Fort Worth, Texas
Plastomatic Corp., Malvern, Pa.
Plast-O-Pak Corp., Leominster, Mass.
•Plax Corp., Hartford, Conn.
Polygon Products Co., Chicago
Pyramid Products Co., Cleveland
Pyro Plastics Corp., Union, N. J.
Resisto Chemical, Inc., Wilmington, Del.
Service Engineers, Inc., Fort Worth, Texas
Shasta Mfg. Co., Berkeley Heights, N. J.
Shaw Insulator Co., Berkeley Heights, N. J.
Sillcocks Miller Co., Maplewood, N. J.
Standard Molding Corp., Dayton, Ohio
Superior Plastics, Inc., Chicago
Syracuse Plastics, Inc., Syracuse, N. Y.
Tech Art Plastics Co., Morristown, N. J.
Technical Industries, Inc., Woodbridge, N. J.
Thermoplastic Processes, Inc., Stirling, N. J.
Transparent Specialties Corp., Cleveland
•Tri-State Plastic Molding Co., Henderson, Ky.
Tupper Co., Woonsocket, R. I.
Twinpak Ltd., Lachine, Que.
United States Box Co., Brooklyn, N. Y.
•Vlchek Tool Co., Cleveland
W & F Mfg. Co., Buffalo, N. Y.
Ward & Douglass, Chatham, N. J.
Waterbury Companies, Waterbury, Conn.
Western Coil & Electrical Co., Racine, Wis.
Wheaton Plastics Co., Mays Landing, N. J.
Whyte Mfg. Co., New York
Wilpet Tool & Mfg. Co., Kearny, N. J.
Wilson Plastic Container Corp., Brooklyn, N. Y.
Wilson Plastics, Inc., Sandusky, Ohio
•Wirz, A. H., Inc., Chester, Pa.

PACKAGE DESIGNERS

Editorial information, Div. IV Sec. 15

ARKANSAS

Challenger Art & Design Service, Camden

CALIFORNIA

Blonder, Howard, & Associates, Downey
Cruze, Charles, Inc., Los Angeles
Farber, Hy, & Associates, Los Angeles
Gilson, Channing Wallace, Los Angeles
Gould & Associates, Inc., Los Angeles
Jepson, Tinsley T., Flintridge
Keck, Henry, Associates, So. Pasadena
Kornfeld, Herbert L., Hollywood
Kweller, Sam, Los Angeles
Laufer, Thomas, & Associates, Sausalito
Landor, Walter, & Associates, San Francisco
Merendino/Greene & Associates, Inc., Pasadena
Porter & Goodman Design Associates, Los Angeles
Sampson, C. C., & Associates, San Francisco
Smith, J. Chris, Inc., Hollywood
Soyster & Ohrenschall, Inc., San Francisco

CONNECTICUT

Banever, Gilbert, Woodbridge
Beall, Lester, Inc., Brookfield Center
Colgate, Wm. Homer, W. Redding
Davis, Orvil, Greenwich
Florian, Gordon, Bridgeport
Hinckley, M. C., Associates, Bridgeport
Neubauer, Robert G., Inc., Fairfield
Rand, Paul, Inc., Weston
Van Dyck Associates, Inc., Westport
Worden, Edwin S., & Associates, Westport

DISTRICT OF COLUMBIA

Packaging Consultants, Inc., Washington

ILLINOIS

Adams, Eugene C., Associates, Westchester
Benjamin, E. Burton, Associates, Chicago
Casler, Arvid, Des Plaines
Chapman, Dave, Inc., Industrial Design, Chicago
Container Laboratories, Inc., Chicago
Design Dynamics, Inc., Northfield
DesignComm, Chicago
Dickens, Robert Sidney, Inc., Chicago
Gaedke, Ray, Chicago
Goldsholl, Morton, Design Associates, Inc., Chicago
Hassler, W. Scott, Associates, Inc., Chicago
Hauser, Jon W., Inc., St. Charles
International Graphics, Inc., Chicago
Jackson, McStay, Co., Chicago
Johnson, Will, Design, Chicago
Jones, Charles E., & Associates, Inc., Lincolnwood
Koopman-Neumer, Chicago
Latham, Tyler, Jensen, Chicago
Lea-Tek Studio, Lake Zurich
Nugent-Graham Studios, Oak Park
Painter, Teague & Petertil, Chicago
Palma-Knapp Associates, River Forest
Port Studios, Chicago
Reinecke & Associates, Chicago
Schwarz, Norbert F., Studio, Chicago
Whitaker Guernsey Studio, Inc., Chicago
Zusi, Charles J., Evanston

INDIANA

Dailey, Don, & Associates, Evansville

KENTUCKY

Tarpey, Thomas, Inc., Louisville

MARYLAND

Dadmun, Royal, & Associates, Inc., Baltimore
Gisriel, George L., Baltimore

MASSACHUSETTS

Alcott Associates, Islington
Schuman, Harold, Studio, Boston
Selame, Joe, Design Associates, W. Newton
Sloan, Francis J., Springfield

MICHIGAN

C & G Packaging, Inc., Midland
Flotepak Corp., Southfield
Harley Earl Associates, Warren
Swibold, Duane, Detroit
Trombley, Pisani & Trombly Design Corp., Birmingham

Addresses of companies listed appear on pp. 808-847

MINNESOTA

Darr, Harold W., Minneapolis
Guyer, Reynolds, St. Paul
Larsen, Ben, Minneapolis

MISSOURI

Designers II, Clayton
Gambon, Thomas F., Associates, St. Louis
Glave, K. L., & Associates, St. Louis

NEW JERSEY

Coe, Norman, Princeton
Eron & Eron, Inc., Englewood
Gershen, Irvin J., Maplewood
Prodigo, Edward F., Inc., Tenafly
Rospond, Jan, Design Studio, Chatham
Schwartz, M., Associates, Newark
Vision Art Studios, Paterson
Zackheim, Eli A., Princeton

NEW YORK

Ahrend Associates, Inc., New York
Alko, Al, Pleasantville
Allcolor Co., New York
Arens, Egmont, Industrial Design, New York
Arnkurt Associates, Inc., New York
Associated Industrial Designers, Div. Design for Selling, Inc., New York
Becker & Becker Associates, New York
Berger, Alan, Laurelton
Bernhard, Lucian, Studio, New York
Berni, Alan, & Associates, Inc., New York
Blod, Francis, Design Associates, Inc., New York
Blumenthal, Margaret M., New York
Brauer, Fred J., Inc., New York
Chinkes, Sam, & Associates, New York
Condon, Frank, Associates, Inc., Northport
Davies, Helen, Co., New York
DeNina, James Andrew, Associates, New York
Deskey, Donald, Associates, Inc., New York
Dixon & Parcels Associates, Inc., New York
Dralle, Elizabeth M., New York
Dusseau, Lambert, New York
Eckstein-Stone, Inc., New York
Ehrman & Reiner, Inc., New York
Federico, Joseph B., Rochester
Ferster, Reinhold C., Buffalo
Fink, Karl, & Associates, New York
Gianninoto, Frank, & Associates, Inc., New York
Graficon, Inc., New York
Grimes, Rose, New York
Grover, Frederic S., Associates, Rochester
Gruen, Robert, Associates, New York
Hainline, Wallace F., Associates, New York
Hodges, Guy, New York
Huxtable, L. Garth, New York
Ingersoll Studios, New York
Jacobsson, Edward Gustave, & Associates, New York
KGA, Inc., New York
Ketcham, Howard, Inc., New York
King-Casey, Inc., New York
Kogan, Belle, Associates, New York
Koons, Irv, Associates, New York
Koppel, E. Leonard, Associates, New York
Krone, Martin, Associates, New York
Lamarque, Abril, New York
Lane-Bender, Inc., New York
Lapow, Harry, Associates, New York
Levin, Monte L., New York
Lewis, Jerome, Brooklyn
Lippincott & Margulies, Inc., New York
Lucas, Mildred, New York
Markley, Margery, New York
Metzig, William, New York
Nesbitt Associates, Ltd., New York
Nielsen, Wm. R., New York
North, Charles W., Studios, Inc., New York
Osborn Charles Associates, Inc., New York
Packaging Arts, Inc., New York
Paige, Richard E., Inc., New York
Penraat, Jaap, Associates, New York
Powell, Gerry, Associates, New York
Promotion Design Associates, Inc., New York
Quantacolor Co., New York
Rosen, Ben, New York
Saco, Ken, Associates, Inc., New York
Sales Equipment & Packaging Corp., New York
Sanford, H. C., Associates, New York
Saphier, Michael, Associates, Inc., New York
Scheele, Edwin H., Woodside
Schiffer-Sussman & Co., New York
Schladermundt, Peter, Associates, New York
Shayn, John, Studio, New York
Singer, Lawrence H., New York
Snyder, Gilbert, Designers, New York
Soltz, M. G., Associates, New York
Spilman, Raymond, New York
Springmeyer Associates, New York
Stahl, Gerald, Inc., New York
Steinweiss, Inc., New York
Stevens-Chase Design Associates, Camillus
Sutnar-office, New York
Tavor, Luba, New York
Teddy Studios, New York
Van Rosen, R. E., New York
Visual Marketing, Inc., New York
Vitale, Lee, Associates, New York
Volpe, Lili, Bellmore
Von Miklos, Josephine, Pound Ridge
Webster, Benjamin L., Woodstock
Yang, Peter Quay, Associates, Inc., New York
Zeidman, Robert, Associates, Inc., New York

OHIO

Bracy & Bracy, Cleveland
Ellies, Dave, Industrial Design, Inc., Columbus
VIE Design Studios, Yellow Springs

PENNSYLVANIA

Bauer, Robert E., Co., Flourtown
Dean, Charles C. S., Philadelphia
Design Planning Associates, Philadelphia
Landell, Harper, & Associates, Philadelphia
Storz, Albert, Philadelphia

TENNESSEE

Thompson, Elmo, Memphis

WISCONSIN

Franz, Richard Max, Waukesha
Package Development Corp., Milwaukee

CANADA

Fogel, Samuel, Associates, Montreal, Que.

PHOTOENGRAVING, RUBBER PRINTING PLATE PATTERNS

Editorial information, Div. IV Sec. 15

Banner Marking Devices Co., Chicago
Koppel Photo Engraving Co., New Haven, Conn.
Mosstype Corp., Waldwick, N. J.
Para Plate & Plastics Co., Los Angeles
Pontiac Graphics, Chicago
Rau Rubber Engraving Co., Hackensack, N. J.
West Essex Printing Plates, Inc., Caldwell, N. J.
Yoder Engraving Co., Middletown, Ohio

PLATING & METALLIZING PLASTICS

Editorial information, Div. II Sec. 8

Amos Molded Plastics, Edinburg, Ind.
Ben-Mont, The Dow Chemical Co., Dobeckmun Div., Bennington, Vt.
Coating Products, Inc., Englewood, N. J.
Eyelet Specialty Div., International Silver Co., Wallingford, Conn.
Flyndustries, Inc., New York
Goodren Products Corp., Englewood, N. J.
Hy-Sil Mfg. Co., Revere, Mass.
Lamart Corp., Clifton, N. J.
Nosco Plastics, Inc., Erie, Pa.
•Owens-Illinois Glass Co., Toledo, Ohio
Plastic Art Metallizing Corp., Brooklyn, N. Y.
Plastic Inlays, Inc., Summit, N. J.
Sierad, Albert E., Co., Mamaroneck, N. Y.
•Standard Packaging Corp., New York

POLYETHYLENE EXTRUDING & TREATING

(Licensing Processes)

Editorial information, Div. I Sec. 4

Gerow, Inc., Pine Brook, N. J.
Traver Investments, Inc., Glencoe, Ill.

PRIVATE LABEL PACKAGING

(See Contract Packaging)

SILK SCREENING

(See Decorating, Custom, on Glass, Plastics & Ceramics)

THERMOFORMING OF PLASTIC SHEET

A. *Blisters & Domes*
B. *Skin Packaging*
C. *Special Forms (Cups, Trays, Contours, Etc.)*
D. *Stretch Packaging*

Editorial information, Div. II Sec. 8

ARIZONA

Specialized Packaging Engineering Co., Phoenix (A)

CALIFORNIA

American Thermoform Corp., Culver City (A, B, C)
Cal-Plastics, San Francisco (A, B, C)
General Plastics Corp., Los Angeles (C)
•MfP Div., Avery Industries, Inc., San Mateo (A, B, C)
Thermo-Plastic Products Co., San Carlos (C)
Weaver Packaging Co., Montrose (A, B, C)

COLORADO

American Die & Box Co., Denver (A, B, C)
Denver Plastics, Inc., Golden (C)

CONNECTICUT

Box Shop, Inc., New Haven (A, B, C)
Commerce Packaging Corp., Stamford (A, B, C)
Curtis, S., & Son, Inc., Sandy Hook (A, C)
Manufacturers Box Co., Bridgeport (A, B, C)
Valley-National Corp., Milldale (A, B, C)
Valley Plastics, Inc., Thompsonville (C)
•Warner Brothers Co./Packaging, Bridgeport (A, B, C)

FLORIDA

Averil, Inc., Miami (A, B, C)
Southern Plastic Products Co., Riviera Beach (A, B, C)

ILLINOIS

Ace Export Packing Co., Chicago (A, B, C)
Acepak, Inc., Chicago (D)
Arvey Corp., Chicago (C)
Bishop, Robert B., Inc., Chicago (A, C)
Chicago Molded Products Corp., Chicago (A, B)
Chicago Paper Box Co., Chicago (C)
Cloud Machine Corp., Skokie (A, C)
•Plastofilm, Inc., Wheaton (A, C)

INDIANA

Borkland Mfg. Co., Marion (A, B, C)
•Creative Packaging, Inc., Indianapolis (A, C)
Crystal Preforming & Packaging, Inc., Warsaw (A, B, C)
•Paper Package Co., Div. Creative Packaging, Inc., Indianapolis (A)

MARYLAND

Artmor Plastic Corp., Cumberland (C)

MASSACHUSETTS

Blank, Arthur, & Co., Boston (A)
Crook, William A., Co., Watertown (A, B, C)
•Dennison Mfg. Co., Framingham (A)
Pioneer Folding Box, Inc., Chicopee (A, C)
Tubed Chemicals Corp., Easthampton (B)

MICHIGAN

Ameriplastic Co., Flint (A, B, C)
Brown Machine Co., Beaverton (C)
Busch, V. W., Mfg. Co., So. Lyon (A, B, C)
Cadillac Plastic & Chemical Co., Detroit (A, C)
Consolidated Paper Co., Monroe (C)
Fabri-Kal Corp., Kalamazoo (A, B, C)
Holley Plastics Co., Warren (A, B)
Michigan Industrial Packaging, Inc., Grand Rapids (A, B, C)

MINNESOTA

Mankato Plastic Co., Mankato (A, B, C)
Mullery Paper Packages, Inc., St. Paul (A)
North Star Industries, Inc., Minneapolis (A, B, C)
Rap Industries, Inc., Minneapolis (A, C)
T. O. Plastics, Inc., Minneapolis (A, C)

MISSOURI

All Packaging Co., Kansas City (A, B, C)
R. C. Can Co., St. Louis (C)

NEW HAMPSHIRE

Hermsdorf Industries, Inc., Manchester (A, C)

NEW JERSEY

Bock Enterprises, Inc., Newark (A, B)
Bro-Dart Industries, Newark (A, C)
•Dyn Corp., Cliffside Park (A, B, C)
Eastern Vacuum Forming Corp., Asbury Park (A, C)
Emeloid Co., Sub. Addressograph-Multigraph Corp., Hillside (C)
Federal Paper Board Co., Bogota (D)
Madan Plastics, Inc., Cranford (A, B, C)
Monroe-Danford & Co., Weehawken (A, B)
Nevins Co., Clifton (D)
Newark Paper Box Co., Newark (A)
Preservation Packaging, Inc., Hillside (A, B, C)
Sillcocks Miller Co., Maplewood (C)
Utility Printing Co., Carlstadt (A, B, C)
Ward & Douglass, Chatham (A)

NEW YORK

American Cellubox Corp., Long Island City (A, B)
Automatic Plastics Corp., Brooklyn (A)
Bo-Mer Mfg. Co., Auburn (A)
Chanal Plastics Corp., Rego Park (A, C)
Clear-Vu Packaging Corp., New York (A, B, C)
Commercial Plastics & Supply Corp., New York (A, B)
Creative Moulded Products Co., Brooklyn (C)
Custom Merchandise Corp., Brooklyn (A, B, C)
DeWitt Plastics, Auburn (C)
Dorey Corrugated Paper Products, Inc., Scottsville (A, B)
•Dyna-Foam Div., Sun Chemical Corp., Ellenville (C)
Formed Container Corp., Sub. Phillips Petroleum Co., Orangeburg (A, C)
Heidi Plastics Corp., Yonkers (A, B, C)
Industrial Transparent Products Corp., Freeport (A, B, C)
Injection Molding Corp., New York (A)
•J. E. Plastics Mfg. Corp., Yonkers (C)
•Jackmeyer Corp., New York (A, B, C)
Landsberger Plastics Co., New York (A, C)
•Lassiter, Div. Riegel Paper Corp., New York (B)
Lee Packaging Laboratories, Inc., Brooklyn (A, B)
Leedpak, Inc., New York (A, B, C)
Lee-Hy Plastics, Inc., Buffalo (A, C)
Lithographers' Finishing Co., New York (B)
Lustra-Cite Industries, Inc., Brooklyn (A)
Melrose Packaging Corp., Flushing (B)
Nordic Plastics Co., Brooklyn (A)
Oxo Plastics, Inc., Brooklyn (A, C)
•Packaging Components, Inc., New York (C)
Pantasote Co., Panta-Pak Div., New York (C)
•Plastic Artisans, Inc., Port Chester (A, C)
Plastic Enterprises, College Point (A, C)
•Plaxall, Inc., Long Island City (A, C)
Polymeroid Co., Woodhaven (A)
Rodgers Packaging, New York (A, B, C)
Romar "Skin-Pack," Inc., Brooklyn (A, B)
•Standard Packaging Corp., New York (A, B, C)
Syracuse Plastics, Inc., Syracuse, (A, B, C)
United States Box Co., Brooklyn (A, B, C)
Ve-Alite Plastic Corp., Brooklyn (A, B, C)
Vis-A-Pak Mfg. Corp., New York (A, B, C, D)
Whyte Mfg. Co., New York (A)

NORTH CAROLINA

Martin, Fair, Boxes, Inc., Concord (A, B, C)

OHIO

•American Packaging Corp., Cleveland (A, B, C)
Hopple Plastics, Inc., Cincinnati (A, B, C)
Plastic Parts Corp., Toledo (A, B, C)
Vacuum Plastics Corp., Columbus (A, B, C)

PENNSYLVANIA

Bolling Industries, Inc., Scranton (A, B, C)
Central Paper Box Co., Lancaster (A, B, C)
Contour Packaging Co., Philadelphia (A, B, C)
•Downingtown Paper Co., Packaging Div., Downingtown (D)
•Globe Industries, Inc., Philadelphia (A)
Long, Bert, Contract Packers, Lancaster (A, B, C)
United Packaging Co., Philadelphia (A, B)

RHODE ISLAND

Shaw-Randall Co., Pawtucket (A, B, C)

TENNESSEE

Kusan, Inc., Nashville (A, B)
Plastic Industries, Inc., Athens (A, B, C)

TEXAS

Loma Industries, Inc., Fort Worth (A, B, C)
Lone Star Plastics Co., Fort Worth (C)
Plasti-Vue Mfg. Co., Fort Worth (C)

VIRGINIA

•Diamond Plastics Industries, Div. Creative Packaging, Inc., Roanoke (A, C)

WEST VIRGINIA

Plastics by Hoover, Huntington (A, C)

WISCONSIN

American Lace Paper Co., Milwaukee (C)
Henschel, C. B., Mfg. Co., Milwaukee (A, B, C)
Pan-O-Ramic Package Co., Janesville (A, B, C)
Rosner Supply Co., Lena (C)
Western Coil & Electrical Co., Racine (A, B, C)

CANADA

American Paper Box Co., Montreal, Que. (A)
Collett-Sproule Boxes Ltd., Scarborough, Ont. (D)
Plasti-Pak Containers Ltd., Toronto, Ont. (C)
Somerville Ltd., London, Ont. (A)
Twinpak Ltd., Lachine, Que. (A, C)

Alphabetical List of Companies and Addresses

A

AAAAAA-Ace Paper Box Co., 472 Broadway, New York 13, N. Y.
A ABA Cellophane Products Corp., 166 Waverly Drive, Pasadena 2, Calif.
AA Cleartest Products Co., 173 Lott Ave., Brooklyn 12, N. Y.
ABC Cellophane Co., Div. Rapid Container Corp., 1370 Utica Ave., Brooklyn 3, N. Y.
A-B-C Packaging Machine Corp., 121 N. Osceola Ave., Clearwater, Fla.
A & E Plastik Pak Co., 652 Mateo St., Los Angeles 21, Calif.
A. J. & K. Co., Box #146, Colchester, Conn.
A-M-R Chemical Co., Inc., 985 E. 35th St., Brooklyn 10, N. Y.
A-1 Mounting & Finishing Co., Inc., 614 W. 131st St., New York 27, N. Y.
AP Applicator Co., 70 Memorial Plaza, Pleasantville, N. Y.
Aacon Industries, Inc., 1905 Surf Ave., Brooklyn 24, N. Y.
Abana Products, Inc., 2500 N. Pulaski Road, Chicago 39, Ill.
Abbeon, Inc., 179-15 Jamaica Ave., Jamaica 32, N. Y.
Abbott Eastern Machinery Sales Corp., 621 E. 216th St., New York 67, N. Y.
•Abbott Plastic Machine Corp., 5726 N. Broadway, Chicago 40, Ill.
Abend, Chester Joshua, Associates, 1074 Parkside, Buffalo 14, N. Y.
Abest Paper Box Co., 69 W. 23rd St., New York 10, N. Y.
Able Container Co., 3021 W. 63rd St., Chicago 29, Ill.
Able Engineering & Equipment, 250—10th Ave., S., Minneapolis 15, Minn.
Abt Lithographers, Inc., Route 1, Branford, Conn.
Academy Ribbon Mills, 129 E. Linden Ave., Burbank, Calif.
Accurate Box Co., Inc., 24 Ave. B, Newark, N. J.
Accurate Flannel Bag Co., 150 W. 22nd St., New York 11, N. Y.
Accurate Molding Corp., 35-20—48th Ave., Long Island City 1, N. Y.
Accurate Steel Rule Die Mfrs., 22 W. 21st St., New York 10, N. Y.
Ace Box Co., 2950 Arkins Court, Denver 5, Colo.
Ace Export Packing Co., Inc., 3427 W. Fillmore St., Chicago 24, Ill.
Ace Folding Box Corp., Middlebury, Ind.
Ace-National Paper Box Co., 837 S. Central Ave., Los Angeles 21, Calif.
Ace Plastic Molding Co., Inc., 1611 S. Laramie, Chicago 50, Ill.
Ace Processing Equipment Co., 6823 S. Kenwood Ave., Chicago 37, Ill.
Ace Wood Turners, 150 Chambers St., New York 7, N. Y.
Acepak, Inc., 7230-40 S. Chicago Ave., Chicago 19, Ill.
Acetate Box Corp., 259 Green St., Brooklyn 22, N. Y.
Acheson Dispersed Pigments Co., 1617 Pennsylvania Blvd., Philadelphia 3, Pa.
•Ackerman Gould Co., Inc., 10 Neil Court, Oceanside, N. Y.
Ackermann, G. A., Printing Co., 1320 S. 54th Ave., Cicero 50, Ill.
•Acme Backing Corp., Canal & Ludlow Sts., Stamford, Conn.
Acme Cellophane Converting Corp., 4327 N. Temple City Blvd., Temple City, Calif.
Acme Folding Box Co., Inc., 1495 Herkimer St., Brooklyn 33, N. Y.
Acme Gravure Services, Inc., 4001 Industrial Ave., Rolling Meadows, Ill.
Acme Packing Co., 122 W. Kinzie St., Chicago 10, Ill.
Acme Pallet Co., Inc., 15 Park Row, New York 38, N. Y.
Acme Paper Box Co., 800 Tennessee St., San Francisco 7, Calif.
Acme Paper Co., 950 Tennessee St., San Francisco 7, Calif.
Acme Partition Co., Inc., 151-161 Fabyan Place, Newark, N. J.
Acme Printing Ink Co., 1419-43 W. Carroll Ave., Chicago 7, Ill.
Acme Staple Co., N. Main St., West Franklin, N. H.
•Acme Steel Co., 135th St. & Perry Ave., Chicago 27, Ill.
Acme Tag Co., 2840 Fremont Ave. S., Minneapolis 8, Minn.
Acorn Corrugated Box Co., 2268 S. Lumber St., Chicago 16, Ill.
Acorn Paper Products Corp., 2122 E. Seventh St., Los Angeles 21, Calif.
Acoustica Associates, Inc., Fairchild Court, Plainview, N. Y.
Acro Chemical Products Corp., P. O. Box 279, Long Valley, N. J.
Acro Tool & Die Works, 4554 Broadway, Chicago 40, Ill.
Acrolite Products, Inc., 810 Martin St., Rahway, N. J.
Action Bag & Envelope Co., Inc., 667 Atkins Ave., Brooklyn 8, N. Y.
Action Marking Products Co., 7211 W. Irving Park Road, Chicago 34, Ill.
Adams, Eugene C., Associates, 810 Manchester Ave., Westchester, Ill.
Adams, R. C., Displays, Inc., 807 Statler Bldg., Boston 16, Mass.
•Adcote Chemicals, Inc., 2401 E. Pratt Blvd., Elk Grove, Ill.
Add-A-Handle Carton Co., 1065 Argyle St., Chicago 40, Ill.
Addison Lithographic Corp., 1664 Monroe Ave., Rochester, N. Y.
Addressograph-Multigraph Corp., 1200 Babbitt Road, Cleveland 17, Ohio
ADhere Corp., 2510 Sharon Rd., Cincinnati 41, Ohio
Adhesive Products Corp., 1660 Boone Ave., New York 60, N. Y.
Adhesive Products, Inc., The, 520 Cleveland Ave., Albany 10, Calif.
Adhesive Tape Corp., 58 Seabring St., Brooklyn 31, N. Y.
Adhesive Tapes Ltd., Elstree Way, Boreham Wood, Herts., England
Adhesives Mfrs. Assn. of America, 441 Lexington Ave., New York, N. Y.
Adjustomatic Packaging Machine Co., 18 Stetson St., Buffalo 6, N. Y.
Admat Co., P. O. Box K, Crichton Station, Mobile, Ala.
Admiral Coated Products, Inc., 20 Railroad Ave., Hackensack, N. J.
Admiral Paperbox Corp., 3250 E. 70th St., Long Beach 5, Calif.
Ad-Stik Co., 5850 Centre Ave., Pittsburgh 6, Pa.
Ad-Vac Plastics Corp., 217 W. 10th St., Indianapolis 2, Ind.
Advance Coatings Co., Depot Road, Westminster, Mass.
Advance Manufacturing Co., 5311 Metropolitan Ave., Brooklyn 37, N. Y.
Advance Molding Corp., 54 W. 21st St., New York 10, N. Y.
Advance Mounting & Die Cutting Co., Inc., 3611—14th Ave., Brooklyn 18, N. Y.
Advance Packaging Co., Inc., 8931 S. State St., Chicago 19, Ill.
Advance Paper Box Co., 1900 W. 62nd St., Los Angeles 47, Calif.
Advance Process Supply Co., Inc., 2315 W. Huron St., Chicago 12, Ill.
Advertising Aides, 200 Park Ave. S., New York 3, N. Y.
Advertising Distributors of America, Inc., 400 Madison Ave., New York 17, N. Y.
Advertising Metal Display Co., 4620 W. 19th St., Chicago 50, Ill.
Aerated Container Corp., Dairy Whip Div., 39 S. LaSalle St., Chicago 3, Ill.
Aerocide Dispensers Ltd., 13 Bethridge Rd., Rexdale, Ont., Canada
Aeroil Products Co., Inc., 69 Wesley St., So. Hackensack, N. J.
Aeropak, Inc., 5000 W. 41st St., Chicago 50, Ill.
Aeroplastics Corp., 4240 Glencoe Ave., Venice, Calif.
Aerosol Blitzer Co., 10 Dell Park Ave., Toronto 19, Ont., Canada
Aerosol Corp. of the South, 12121 Highway 70, Arlington, Tenn.
•Aerosol Machinery Co., 80 Magnolia Ave., Westbury, N. Y.
Aerosol Research Co., 743 Circle Ave., Forest Park, Ill.
Aerosol Techniques, Inc., 111 Silliman Ave., Bridgeport 5, Conn.
Aetna Electronics Corp., Readington Rd., North Branch, N. J.
Ahrend Associates, Inc., 601 Madison Ave., New York 22, N. Y.
Aidlin Automation, Inc., 1613 E. New York Ave., Brooklyn 12, N. Y.
Ainslie Co., Div. Boise Cascade Corp., E. 304 Second Ave., Spokane 3, Wash.
Air Fixtures, Inc., 225 E. Main St., No. Manchester, Ind.
Air Formed Products Corp., Sub. Bemis Bro. Bag Co., Haines St. Extension, Nashua, N. H.
Air Reduction Chemical & Carbide Co., Div. Air Reduction Co., Inc., 150 E. 42nd St., New York 17, N. Y.
Air Reduction Sales Co., 150 E. 42nd St., New York 17, N. Y.
Air-Lite Products, Inc., 263 Fifth St., Cambridge 42, Mass.

Air-O-Plastik Corp., 310–17th St., Union City, N. J.
Airosol Co., Inc., 525 N. 11th St., Neodesha, Kan.
Airpak, Inc., 179 Goffle Rd., Hawthorne, N. J.
Air-Perme-Ator Mfg. Co., 300 Preakness Ave., Paterson 2, N. J.
Ajax Box Co., Div. St. Regis Paper Co., 2210 S. Union Ave., Chicago 16, Ill.
Ajax Comb Co., Div. Vulcanized Rubber & Plastics Co., 5 S. Pennsylvania Ave., Morrisville, Pa.
Ajax Packaging & Plastics, 1881 N.W. 20th St., Miami 52, Fla.
Ajusto Equipment Co., 515 Conneaut St., Bowling Green, Ohio
Akers, Charles E., 201 N. Wells St., Chicago 6, Ill.
Akron Equipment Co., The, 633 E. Exchange St., Akron 9, Ohio
Aladdin Transparent Packaging Corp., 608 Main St., Westbury, N. Y.
Albany Corrugated Container Corp., Cohoes, N. Y.
Albany Press Label Printers, Inc., 5141 W. Grand Ave., Chicago 39, Ill.
Albemarle Paper Mfg. Co., P. O. Box 2189, Richmond 17, Va.
Alclyde Engraving Co., Inc., 36-40 Commerce St., Chatham, N. J.
Alco Plastics, Inc., 722 Indian Creek, Council Bluffs, Iowa
Alcott Associates, 291 Washington St., Islington, Mass.
Alcraft Display Co., 12 E. 18th St., New York 3, N. Y.
Alden & Ott Printing Inks Co., 4030 N. Rockwell St., Chicago 18, Ill.
Alden Plastic Corp., 1170 Broadway, New York 1, N. Y.
Alderman Paper Box Corp., 31 Exchange St., Rochester 14, N. Y.
Aldine Paper Co., Inc., 535 Fifth Ave., New York 17, N. Y.
Alemite Div., Stewart-Warner Corp., 1826 Diversey Parkway, Chicago, Ill.
Alert Paper Products Co., 403 Greenwood Ave., Brooklyn 18, N. Y.
Alfa Mfg. Co., 1665 Milwaukee Ave., Chicago 47, Ill.
Alford Cartons, Div. Continental Paper Co., Industrial Ave., Ridgefield Park, N. J.
Algene Marking Equipment Co., 232 Palisade Ave., Garfield, N. J.
Alko, Al, Old Farm Rd., Pleasantville, N. Y.
All Bound Box Institute, 1171 Beach Blvd., Jacksonville Beach, Fla.
All Packaging Co., Inc., 224 W. Fifth St., Kansas City 5, Mo.
Alladin Plastics, Inc., 1415 W. 178th St., Gardena, Calif.
Allbright-Nell Co., The, 5323 S. Western Blvd., Chicago 9, Ill.
Allcolor Co., Inc., 566 Seventh Ave., New York 11, N. Y.
Allcraft Container Corp., 405 Kingsland Ave., Harrison, N. J.
•Allegheny-Fuller Div., Standard Packaging Corp., 500 Dargan St., Pittsburgh 24, Pa.
Allegheny Steel Band Co., P. O. Box 716, Pittsburgh 30, Pa.
Allen Cartons, Inc., 1 Campbell St., Dayton 1, Ohio
•Allen Hollander Co., Inc., 385 Gerard Ave., New York 52, N. Y.
Allen & Hull, Inc., Allen St., Rochester, N. H.
Allenair Corp., 255 E. Second St., Mineola, N. Y.
Alliance Paper Mills Ltd., Merritton, Ont., Canada
Alliance Paper & Packaging Co., Inc., 1815 Lakeville Road, New Hyde Park, N. Y.
Allied Chemical Corp.
General Offices, 40 Rector St., New York 6, N. Y.
Barrett Div., 40 Rector St., New York 6, N. Y.
•General Chemical Div., 40 Rector St., New York 6, N. Y.
•Plastics Div., 40 Rector St., New York 6, N. Y.
Plastics & Coal Chemicals Div., 75 West St., New York, N. Y.
Allied Commodities Co., 5601 W. Lake St., Minneapolis 16, Minn.
Allied Container Corp., 1 Allied Drive, Dedham, Mass.
Allied Decals, Inc., 8400 Hough Ave., Cleveland 3, Ohio
Allied Display Materials, Inc., 241 W. 23rd St., New York 11, N. Y.
Allied Equipment Co., 940 Nepperhan Ave., Yonkers 3, N. Y.
Allied Paper Corp., 1608 Lake St., Kalamazoo, Mich.
Allied Plastics Co., 6231 S. Manhattan Pl., Los Angeles 47, Calif.
Allis-Chalmers Mfg. Co., 1124 S. 70th St., Milwaukee 1, Wis.
Allpak Co., 161 E. Grand St., Chicago 11, Ill.
All-Pak, Inc., 2017 Preble Ave., Pittsburgh 33, Pa.
Alsten Co., The, 71 Jefferson Ave., Jersey City 6, N. J.
Altair Machinery Corp., 55 Vandam St., New York 13, N. Y.
Alton Box Board Co., Box 276, Alton, Ill.
Alton Boxmakers, Inc., P. O. Box 236, Pacific, Mo.
Alufoil Products Co., Inc., 15 Ferry St., New York 38, N. Y.
•Aluminum Co. of America, 1501 Alcoa Bldg., Pittsburgh 19, Pa.
Aluminum Foil Container Mfrs. Assn., Inc., 1008 Park Bldg., Pittsburgh 22, Pa.
Aluminum Foil Packaging Co., Fort Madison, Iowa
Aluminum Products Corp., 551 W. Third St., Fulton, N. Y.
Alvey Conveyor Mfg. Co., 9301 Olive St. Road, St. Louis 32, Mo.
Alvey-Ferguson Co., The, Disney St., Cincinnati 9, Ohio
Amac Plastic Products Corp., Industrial Center Bldg. Sausalito, Calif.
•Amaco, Inc., 2601 W. Peterson Ave., Chicago 45, Ill.
American Adhesive Mfg. Co., Inc., 30 Waverly Ave., Brooklyn 5, N. Y.
American Aerosol Corp., 689 Gordon St., Holland, Mich.
American Aluminum Co., Sheffield St., Mountainside, N. J.
•American Bag & Paper Corp., Water & South Sts., Philadelphia 47, Pa.
American Bottlers Equipment Co., 308 Wyndhurst Ave., Baltimore 10, Md.
American Box Co., The, 1900 W. Third St., Cleveland 13, Ohio
American Box Corp., 2740 Hyde St., San Francisco 19, Calif.
American Box & Tag Co., 400 Jefferson Hwy., New Orleans 21, La.
American Can Co.
General Offices, 100 Park Ave., New York 17, N. Y.
American-Wheaton Glass Corp., N. Tenth St., Millville, N. J.
Bradley-Sun Div., U. S. Route 22, Union, N. J.
•Canco Div., 100 Park Ave., New York 17, N. Y.
Dixie Cup Div., 24th & Dixie Ave., Easton, Pa.
Marathon, Div., Menasha, Wis.
American Cardboard Corp., 2900 N. Eleventh St., Philadelphia 33, Pa.
American Carton Wrapper Co., 540 Lake Shore Drive, Chicago 11, Ill.
American Cellophane & Plastic Films Corp., 32 S. Market St., Boston 9, Mass.
American Cellubox Corp., 27-01 Bridge Plaza N., Long Island City 1, N. Y.
American Cellular Corp., The, 8501 S.W. 129th Terrace, Miami 56, Fla.
American Chemical Society, 430 Park Ave., New York, N. Y.
American Colortype Co., 1151 Roscoe St., Chicago 13, Ill.
American Cordage & Paper Corp., 335-361 W. 36th St., New York 18, N. Y.
American Cork Specialties Co., Inc., 140 Junius St., Brooklyn 12, N. Y.
American Corrugated Paper Products Corp., 357 W. 17th St., New York, N. Y.
American Cyanamid Co.
General Offices, 30 Rockefeller Plaza, New York, N. Y.
•Dyes Dept., Bound Brook, N. J.
Intermediates Dept., Bound Brook, N.J.
Plastics & Resins Div., Wallingford, Conn.
American Decalcomania Co., Inc., 4344 W. Fifth Ave., Chicago 24, Ill.
American Die & Box Co., 999 S. Logan St., Denver 9, Colo.
American Engineering & Design Corp., New London, Conn.
American Engraving & Machine Co., 719 Livingston St., Elizabeth, N. J.
American Evatype Corp., 750 Central Ave., Deerfield, Ill.
American Excelsior Corp., 1000 N. Halsted St., Chicago 22, Ill.
American Fabricated Products Co., 1420 E. 20th St., Indianapolis 7, Ind.
American Flange & Mfg. Co., Inc., 30 Rockefeller Plaza, New York 20, N. Y.
American Forest Products Co., Box 911, Norristown, Pa.
American Industrial Chemical Co., Div. Amerace Corp., Cooper Park, Butler, N. J.
American Industries Co., Div. American Shredded Paper Co., 67 Vaughan Ave., Dorchester, Boston 21, Mass.
American Instrument Co., Inc., 8030 Georgia Ave., Silver Spring, Md.
American Insulator Corp., New Freedom, Pa.
American Kleer-Vu Plastics, Inc., 76 Madison Ave., New York 16, N. Y.
American Lace Paper Co., 4425 N. Port Washington Road, Milwaukee 12, Wis.
American Latex Fibre Corp., 500 Broadway, Lawrence, Mass.
American Latex Products Corp., 3341 W. El Segundo Blvd., Hawthorne, Calif.
American Machine & Foundry Co., 261 Madison Ave., New York 16, N. Y.
American Machine Works, Inc., 1320 Clark St., Racine, Wis.
American Machinery Corp., P.O. Box 3228, Orlando, Fla.
American Management Assn., 1515 Broadway, New York 36, N. Y.
American Marketing Assn., 27 E. Monroe St., Chicago, Ill.
American Meat Institute, 59 E. Van Buren St., Chicago 5, Ill.
American Molding Powder & Chemical Corp., 703 Bedford Ave., Brooklyn 6, N. Y.
American National Bag & Burlap Co., Inc., 343-349 Kent Ave., Brooklyn 11, N. Y.
•American Packaging Corp., The, 1523 E. 45th St., Cleveland 3, Ohio
American Pan Div., The American Tool Works Co., 720 E. Pearl St., Cincinnati 2, Ohio
American Paper Box Co., Inc., 200 High St., Boston 10, Mass.
American Paper Box Co. Ltd., 5700 Fullum St., Montreal 36, Que., Canada

American Paper Products Co., 2113-31 E. Rush St., Philadelphia 34, Pa.
American Partition Co., Div. Standard Brands, Inc., 3043 N. 30th St., Milwaukee 10, Wis.
American Plastic Products, 53-06 Grand Ave., Maspeth, N. Y.
American Plastics Corp., 342 Madison Ave., New York 17, N. Y.
American Potash & Chemical Corp., 3030 W. Sixth St., Los Angeles 54, Calif.
American "Pres-Stix" Tape Co., 4058 Beaufait Ave., Detroit 7, Mich.
American Products Mfg Co., 8127 Oleander St., New Orleans 18, La.
American Pulp & Paper Mill Superintendents Assn., The, 327 S. LaSalle St., Chicago 4, Ill.
American Pyroxylin Corp., Schuyler & Garfield Aves., Arlington, N. J.
American Research Merchandising Institute, Merchandise Mart Plaza, Chicago 54, Ill.
American Resin Corp., 3215 N. Sheffield St., Chicago 13, Ill.
American Roland Corp., 16 Hudson St., New York 13, N. Y.
American Sealcone Corp., 1911 Park Ave., New York 35, N. Y.
American Seal-Kap Corp., 11-05—44th Drive, Long Island City, 1, N. Y.
American Silver Co., 36-07 Prince St., Flushing 54, N. Y.
American Sisalkraft Co., 55 Starkey Ave., Attleboro, Mass.
American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.
American Society of Industrial Designers, 15 E. 48th St., New York, N. Y.
American Specialty Co., The, Jackson St., Amherst, Ohio
American Standards Assn., Inc., 10 E. 40th St., New York 16, N. Y.
American Star Cork Co., Inc., 175 N. Ninth St., Brooklyn 11, N. Y.
American Sterilizer Co., 2424 W. 23rd St., Erie 6, Pa.
•American Tag Co., 151 Cortlandt St., Belleville 9, N. J.
American Thermoform Corp., 5713 Joanne Place, Culver City, Calif.
American Tool Works Co., Pearl & Eggleston Sts., Cincinnati 2, Ohio
American Tri-State Paper Box Co., 808—17th Ave. N., Nashville 4, Tenn.
American Type Founders Co., Inc., 200 Elmora Ave., Elizabeth, N. J.
American Veneer Package Assn., Inc., 1225½ N. Orange Ave., Orlando, Fla.
•American Viscose Corp., Film Div., 1617 Pennsylvania Blvd., Philadelphia 3, Pa.
American Wood Products Corp., Box 681, Marion, S. C.
American-Marietta Co.
•Consolidated Engravers Div., 311 E. 12th St., Charlotte 1, N. C.
Metals Disintegrating Co., Div., Box 290, Elizabeth, N. J.
Sinclair & Valentine Co., Printing Ink Div., 611 W. 129th St., New York 27, N. Y.
Stoner-Mudge Co., Div., 2000 Westhall St., Pittsburgh 33, Pa.
American-Wheaton Glass Corp., N. Tenth St., Millville, N. J.
Ameriplastic Co., Inc., The, 3161 Torrey Rd., Flint 7, Mich.
Ames Bag & Packaging Corp., 1903 Selma Ave., Selma, Ala.
Ames Harris Neville Co., Sub. Boise Cascade Corp., Multiwall Bag Div., 2603 Eighth St., Berkeley 2, Calif.
Ames Plastic Machinery Corp., 65-50 Austin St., Rego Park 74, N. Y.
Ames Safety Envelope Co., 21 Vine St., Somerville 43, Mass.
Amos Molded Plastics, Edinburg, Ind.
Ampoule Machine Co., 38-09—24th St., Long Island City 1, N. Y.
Ams, Max, Machine Co., The, Scofield Ave., Bridgeport 5, Conn.
•Amsco Packaging Machinery, Inc., 31-31—48th Ave., Long Island City 1, N. Y.
•Anaconda Aluminum Co., 1430 S. 13th St., Louisville 1, Ky.
•Anchor Hocking Glass Corp., 20 Glass Ave., Lancaster, Ohio
•Anchor Plastics Co., Inc., 36-36—36th St., Long Island City 6, N. Y.
Anchor Steel & Conveyor Co., 6906 Kingsley Ave., Dearborn, Mich.
Ander Chemical Corp., 630 Glendale Milford Road, Cincinnati 18, Ohio
Andersen, A. J., Co., 429 W. Superior St., Chicago 10, Ill.
Andersen & Bruun's Fabriker A/S, Copenhagen, F, Denmark
Anderson Bros. Mfg. Co., 1907 Kishwaukee St., Rockford, Ill.
Anderson, Elmo, Associates, 39 W. 55th St., New York 19, N. Y.
Anderson, George W., Inc., 36-02—38th St., Long Island City 1, N. Y.
Anderson, R. P., Co., 2503 W. Mockingbird Lane, Dallas 35, Texas
Anderson, Ralph, Studio, 310 Pine St., Green Bay, Wis.
Anderson-Bolds, Inc., 2012 W. 25th St., Cleveland 13, Ohio
Andler, Israel, & Sons, Inc., 130 Gore St., E. Cambridge 41, Mass.
Andmar Plastic Co., Inc., U.S. Highway #46 & Trenton Ave., Clifton, N. J.
Andora Automation, Inc., 170 East 51st St., Brooklyn 3, N. Y.
Andover Industries, Inc., Div. Erie Resistor Corp., Andover, Ohio
Andre Paper Box Co., 1950 First Ave., San Leandro, Calif.
Andrews, O. B., Co., P.O. Box 431, Chattanooga, Tenn.
Andrews, P. L., Corp., Andrews Road, Hicksville, N. Y.
Angell Manufacturing Co., 1071 E. Monument Ave., Dayton 1, Ohio
Angelus Sanitary Can Machine Co., 4900 Pacific Blvd., Los Angeles 58, Calif.
Anigraphic Decorators, Inc., 237 Main St., Cliffside Park, N. J.
•Animal Trap Co. of America, Lititz, Pa.
Anker Paper Box Factory, 4068 Avalon Blvd., Los Angeles 11, Calif.
Anodyne, Inc., 1270 N.W. 165th St., No. Miami Beach 69, Fla.
Ansell, S. H., & Son, Inc., 817-825 Summer St., Boston 27, Mass.
Antara Chemicals, Div. General Aniline & Film Corp., 435 Hudson St., New York 14, N. Y.
Anthony & Anthony, 475 Fifth Ave., New York 17, N. Y.
Apcon Co., Inc., 25th St. & Kingshighway, Independence, Mo.
Apex Cooperage Co., P.O. Box 1066, Joliet, Ill.
•Apex Machine Co., 14-13—118th St., College Point 56, N. Y.
Apex Paper Box Co., The, 2716 E. 79th St., Cleveland 4, Ohio
Apex Paper Box Corp., 311 W. Superior St., Chicago 10, Ill.
Appalachian Steel Corp., Schuyler & Page Aves., Lyndhurst, N. J.
Appleford Paper Products Ltd., 425 Parkdale Ave. N., Hamilton, Ont., Canada
Appleton Coated Paper Co., The, 825 E. Wisconsin Ave., Appleton, Wis.
•Appleton Machine Co., 618 S. Oneida St., Appleton, Wis.
Applicator Co., The, 157-163—13th St., Brooklyn 15, N. Y.
Applicolor, Inc., 1501 S. Laflin St., Chicago 8, Ill.
Applicon Machines, 21877 Euclid Ave., Cleveland 17, Ohio
Arabol Mfg. Co., The, 110 E. 42nd St., New York 17, N. Y.
Arbetter Ribbon & Mfg. Co., 3816 Montrose Ave., Chicago 18, Ill.
Arbib, Richard, Co., Inc., 250 W. 57th St., New York 19, N. Y.
Archer Label Co., 783 Kohler St., Los Angeles 21, Calif.
•Arenco Machine Co., Inc., 25 W. 43rd St., New York 36, N. Y.
Arens, Egmont, 480 Lexington Ave., New York 17, N. Y.
Arizona Container Corp., 2925 W. Whitton Ave., Phoenix, Ariz.
Arkadia Label Corp., 126 W. 22nd St., New York 11, N. Y.
Arkay Printing Co., Inc., 200 Hudson St., New York 13, N. Y.
Arkell Safety Bag Co., 10 E. 40th St., New York 16, N. Y.
Arkell & Smiths, Hudson Falls, N. Y.
Arlington Aluminum Co., 19011 W. Davison, Detroit 23, Mich.
Arlington Box Co., Arlington, Ga.
Armor Box Corp., 121 Sussex Ave., Newark 4, N. J.
Armour Alliance Industries, 16123 Armour St. N.E., Alliance, Ohio
•Armstrong Cork Co., W. Liberty St., Lancaster, Pa.
Armstrong Laboratories, Inc., 421 LaGrange St., West Roxbury 32, Mass.
Armstrong Machine Works, 1819 Maple St., Three Rivers, Mich.
Arner Co., Inc., The, 165 Swan St., Buffalo 3, N. Y.
Arnkurt Associates, 210 W. 29th St., New York 1, N. Y.
Arno Adhesive Tapes, Inc., U. S. Rte. 20 at Ohio St., Michigan City, Ind.
Arnold-Copeland Corp., P. O. Box 1083, Norton, Mass.
Arrow Converting Equipment, Inc., 271 Grove Ave., Verona, N. J.
Arrow Fastener Co., Inc., 1 Junius St., Brooklyn 12, N. Y.
Arrow Mfg. Co., Inc., 567—52nd St., West New York, N. J.
Arrow Plastics Corp., 1 Mattimore St., Passaic, N. J.
Art Decorating Co., 4201 Hudson Blvd., No. Bergen, N. J.
Art Masters, 156 W. 44th St., New York 36, N. Y.
Art Tube Co., Inc., 500 Lyons Ave., Irvington 11, N. J.
Art-Glo Associates, P.O. Box 273, Pitman, N. J.
Artcote Papers, Inc., 390 Coit St., Irvington 11, N. J.
Art-Craft Mfg. Co., 126-28 S. Clinton St., Chicago 6, Ill.
Artcraft Paper Co., 8103 Beach St., Los Angeles 1, Calif.
Artistic Flower Co., Inc., 24 E. 21st St., New York 10, N. Y.
Artistic Mfg. Co., Sub. Sun Chemical Corp., 375 Fairfield Ave., Stamford, Conn.
Artistic Paper Box Co., Inc., 134 Spring St., New York 12, N. Y.
Artists, Inc., 705 Third Ave. S., Minneapolis 2, Minn.
Artmor Plastics Corp., 1003 Oldtown Road, Cumberland, Md.
Arundel Box & Coating Corp., 4903 Snader Ave., Baltimore 15, Md.
Arvey Corp., 3500 N. Kimball Ave., Chicago 18, Ill.
Ashtabula Corrugated Box Co., The, 3714 Ann Ave., Ashtabula, Ohio
Ashworth Bros., Inc., P.O. Box 278, Winchester, Va.
Associated Bag & Apron Co., 901 W. Huron St., Chicago 22, Ill.
Associated Box Corp., 812 N. Cedar St., New Castle, Pa.
Associated Brands, Inc., 50 Wallabout St., Brooklyn 11, N. Y.

Associated Cooperage Industries of America, Inc., The, 408 Olive St., St. Louis 2, Mo.
Associated Designers, 664 N. Michigan Ave., Chicago 11, Ill.
Associated Folding Box Corp., 240 Canal St., Lawrence, Mass.
Associated Industrial Designers, Div. Design for Selling, Inc., 95 Madison Ave., New York 16, N. Y.
Associated Label Co., 1246 E. Olympic Blvd., Los Angeles 21, Calif.
Associated Plastic Div., Commercial Plastics Co., 945 George St., Chicago 14, Ill.
Associated Plastics, Inc., 1510 University Rd., Cleveland 13, Ohio
Assn. of Creative Artists, Inc., 438 W. 37th St., New York, N. Y.
Astarita Associates, 145 E. 49th St., New York 17, N. Y.
Aster Flower Co., 11 W. 37th St., New York 18, N. Y.
Atkron, Inc., P.O. Box 311, Cuyahoga Falls, Ohio
Atlanta Film Converting Co., 1132 Pryor St. S.W., Atlanta, Ga.
Atlantic Can Co., 300 Park Ave., Delawanna, N. J.
Atlantic Carton Corp., N. Main St., Norwich, Conn.
Atlantic Coffee Bag Co., Inc., 220 Kosciusko St., Brooklyn 16, N. Y.
Atlantic Container Corp., 48-08—30th Place, Long Island City 1, N. Y.
Atlantic Glass Co., 918 E. Fort Ave., Baltimore 30, Md.
Atlantic Gummed Paper Corp., 1 Main St., Brooklyn 1, N. Y.
Atlantic Mfg. Co., 557 Belmont Ave., Newark 8, N. J.
Atlantic Paper Box Co., 46 Waltham St., Boston 18, Mass.
Atlantic Plastics, Inc., 60 Bonner St., Stamford, Conn.
Atlantic Powdered Metals, Inc., 38 Park Row, New York 7, N. Y.
Atlas-Boxmakers, Inc., 5025 W. 65th St., Chicago 38, Ill.
Atlas Coatings Corp., 5-35—47th Ave., Long Island City 1, N. Y.
Atlas General Industries, Inc., 635 Madison Ave., New York 22, N. Y.
Atlas Labeling Machine Corp., 39-30 Crescent St., Long Island City 1, N. Y.
Atlas Pallet & Lumber Sales, Inc., 4855 S. Racine St., Chicago 9, Ill.
Atlas Paper Box Co., Inc., 1300 Central Ave., Chattanooga 2, Tenn.
Atlas Roll Leaf Corp., 405 Lexington Ave., New York 17, N. Y.
Atlas Silk Screen Supply Co., 1733 Milwaukee Ave., Chicago 47, Ill.
Atlas Stamp Co., The, 2936 Mahoning Ave., Youngstown, Ohio
Atlas Tag Co., 10 Orange St., Neenah, Wis.
•Atlas Vac-Machine Corp., 1732 Hudson Ave., Rochester 17, N. Y.
Atlas Vacuum Corp., 340 Lyell Ave., Rochester 6, N. Y.
Atlas-Sandt Corp., 240-42 W. 23rd St., New York 11, N. Y.
Atmosphere Control Co., Inc., 5315 Chester Ave., Philadelphia 43, Pa.
Atronic Products, W. Conshohocken, Pa.
Attleboro Printing & Embossing Co., Inc., 54 Union St., Attleboro, Mass.
Atwood Adhesives, Inc., 1000 Eighth Ave. S., Seattle 4, Wash.
Auburn Plastics, Inc., 24 McMaster St., Auburn, N. Y.
•Auer, J. F., Inc., 313 Halstead Ave., Mamaroneck, N. Y.
Augusta Plastics, Inc., 3820 Boston Post Road, New York 69, N. Y.
Auler Displays, 2100 W. Pierce St., Milwaukee 46, Wis.
Austin Industries, Inc., 133 E. Main St., Marlboro, Mass.
Austin, O., 250 Dover St., Brooklyn 35, N. Y.
Auto Wrappers (Norwich) Ltd., Edward St., Norwich, England
Auto-Blow Corp., Div. National Cleveland Corp., 105 Meadow St., Fairfield, Conn.
Auto-Case Machinery Co., Inc., 8609 Oakview Ave., Richmond 28, Va.
Autokraft Box Corp., P. O. Box 189, York, Pa.
Automatic Marking Equipment, Inc., 207 Fulton St., New York 7, N. Y.
Automatic Plastics Corp., 905 Atlantic Ave., Brooklyn, N. Y.
Automatic Scale Co., Inc., 180 Lafayette St., New York 13, N. Y.
Automatic Transportation Co., 101 W. 87th St., Chicago 20, Ill.
Automation Devices, Inc., 3125 Brandes St., Erie, Pa.
Automation Engineering Laboratory, Inc., 84 Commerce Rd., Stamford, Conn.
Automation Fastening Co., Inc., 1220 W. Ninth St., Cleveland 13, Ohio
Automation Management, Inc., 25 Brigham St., Westboro 5, Mass.
Automation Products, Inc., 3030 Max Roy St., Houston 24, Texas
Auto-Pack Co., P.O. Box 504, Jeffersonville, Ind.
Autopack Ltd., Spring Lane, Malvern Link, Worcestershire, England
Autotron, Inc., 3629 N. Vermilion St., Danville, Ill.
Auto-Vac Co., Div. National Cleveland Corp., 105 Meadow St., Fairfield, Conn.
Avalon Paper Box Co., Inc., 8723 Avalon Blvd., Los Angeles 3, Calif.
Averil, Inc., 6780 N.W. 37th Court, Miami 47, Fla.
Avery Label Co., Div. Avery Adhesive Products, Inc., 1616 S. California Ave., Monrovia, Calif.
Avion Div., ACF Industries, Inc., 11 Park Pl., Paramus, N. J.
•AviSun Corp., 1345 Chestnut St., Philadelphia 7, Pa.
Axberg, A. H., & Associates, 855 Avenue of the Americas, New York 1, N. Y.
Ayers & Grimshaw Ltd., Barnstaple, Devon, England
Ayers, Samuel, Jr., Associates, 711 Boylston St., Boston 16, Mass.

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B. B. Chemical Co., 784 Memorial Dr., Cambridge 39, Mass.
B-B Shipping Room Supply Co., 564 W. Randolph St., Chicago 6, Ill.
B & D Bag Tying Machine Co., 60 Fulda St., Roxbury 19, Mass.
Babbitt Chemical Co., Inc., 38 Prospect St., New Bedford, Mass.
Babcock Box Co., Inc., 43 S. Main St., Attleboro, Mass.
Backes', M., Sons, Inc., 105 S. Elm St., Wallingford, Conn.
Badger Carton Co., Inc., 5431 N. 27th St., Milwaukee 9, Wis.
Bagcraft Corp. of America, 3900 W. 43rd St., Chicago 32, Ill.
Bagmatic Products Corp., 1323 Randall Ave., New York 59, N. Y.
Bag-O-Matic Packaging Equipment Co., Inc., 4300 Melrose Ave., Los Angeles 29, Calif.
Bagphane Corp., 2800 College Point Causeway, Flushing 55, N. Y.
Bagprint Machinery Corp., Sub. Valley Iron Works Co., 401 E. South Island St., Appleton, Wis.
Bahnson Co., The, 1001 S. Marshall St., Winston-Salem, N. C.
Bakan Plastics, P. O. Box 78, Kansas City 41, Mo.
Baker, C. P., & Co., 501 N. Eleventh St., Philadelphia 23, Pa.
Baker Industrial Trucks, Div. Otis Elevator Co., 8095 Baker Ave., Cleveland 2, Ohio
Baker, William M., 301 E. 38th St., New York 16, N. Y.
Baldwin, Eli, & Son, Inc., 356 W. 18th St., New York 11, N. Y.
Baldwin-Lima-Hamilton Corp., Industrial Equipment Div., Philadelphia 42, Pa.
Balemaster Div., East Chicago Machine Tool Corp., 4801 Railroad Ave., East Chicago, Ind.
•Ball Brothers Co., Inc., 1509 S. Macedonia Ave., Muncie, Ind.
Ballthrall Engineering Co., 1505 Race St., Philadelphia 2, Pa.
Baltimore Metal Products, Inc., 25 N. Third St., Brooklyn 11, N. Y.
Bancroft Bag Factory, Inc., 425 Bancroft Blvd., West Monroe, La.
Banever, Gilbert, Ansonia Rd., Woodbridge 15, Conn.
Banka-Mango Design, Merchandise Mart, Chicago 54, Ill.
Banner Fiber Glass Products Corp., 80 Beckwith Ave., Paterson 3, N. J.
Banner Fiberboard Co., P.O. Box 390, Wellsburg, W. Va.
Banner Marking Devices Co., 3901 N. Western Ave., Chicago 18, Ill.
Barber-Greene Co., 400 N. Highland Ave., Aurora, Ill.
Barco Chemical Products Co., 701-3 S. LaSalle St., Chicago 5, Ill.
Bard Pharmaceuticals, Inc., 99-101 Saw Mill River Rd., Yonkers, N. Y.
Bardes, A. G., Co., Inc., 5225 W. Clinton Ave., Milwaukee 23, Wis.
Bareco Wax Co., Div. Petrolite Corp., 917 Enterprise Bldg., Tulsa 3, Okla.
Barger Box & Printing Co., 1511 W. Lusher Ave., Elkhart, Ind.
Barkley & Dexter, Inc., 50 Frankfort St., Fitchburg, Mass.
Barnes, W. F. & John, Co., 301 S. Water St., Rockford, Ill.
Barnett, Samuel, Co., 22nd & Lehigh Ave., Philadelphia 32, Pa.
Barr, G., & Co., 3601 S. Racine Ave., Chicago 9, Ill.
Barraclough, R. W., Ltd., Hartwood Road, Southport, Lancashire, England
Barrett-Cravens Co., 630 Dundee Road, Northbrook, Ill.
Barrett Div., Allied Chemical Corp., 40 Rector St., New York 6, N. Y.
Barry Controls, Div. Barry Wright Corp., 700 Pleasant St., Watertown 72, Mass.
Barry-Wehmiller Machinery Co., 4660 W. Florissant Ave., St. Louis 15, Mo.
Barsky, Arnold, Inc., 15-19 Ferry St., New York 38, N. Y.
•Bartelt Engineering Co., 1900 Harrison Ave., Rockford, Ill.
Bartgis Bros. Co., The, Ilchester, Md.
Bartlett, F. P., & Co., Inc., 130 Jackson St., Canton, Mass.
Bartlett Label Co., 2135 Portage St., Kalamazoo 29, Mich.
Basca Mfg. Co., 2222 N. Olney St., Indianapolis 18, Ind.
Basic Material Supply Co., Inc., 27 William St., New York 5, N. Y.
Batchelder Engineering Co., Inc., 125 Main St., Springfield, Vt.
Bates Mfg. Co., The, 18 Central Ave., West Orange, N. J.
Battelle Memorial Institute, 505 King Ave., Columbus 1, Ohio
•Battle Creek Packaging Machines, Inc., 113—12th St., Battle Creek, Mich.

Bauer & Black, Div. of The Kendall Co., 309 W. Jackson Blvd., Chicago 6, Ill.
Bauer, Litzy R., 153-30–78th Ave., Flushing 67, N. Y.
Bauer, Robert E., Co., 720 Bethlehem Pike, Whitemarsh Township, Flourtown, Pa.
Baumann, Franz, & Co., Talstrasse 39, Zurich 1, Switzerland
Baxter, J. C., Co., Minerva, Ohio
Bay Cities Paperbox Co., 646 Kennedy St., Oakland 6, Calif.
Bayberry Products Corp., 50 John St., Stamford, Conn.
Bayside Timers, 45-25–162nd St., Flushing 58, N. Y.
Beacon Boxes, Inc., P.O. Box 483, Massillon, Ohio
Beacon Machinery, Inc., 31st & Tudor, East St. Louis, Ill.
Beacon Packing Corp., 242 S. First St., Brooklyn 11, N. Y.
Beacon Paper Bag Co., Inc., 37 Midland Ave., East Paterson, N. J.
Beall, Lester, Inc., Dumbarton Farm, Brookfield Center, Conn.
Beaman Plastics, 1702 N. E. Sandy Blvd., Portland 14, Ore.
Beasley, French & Co., Inc., 110 E. 31st St., New York 16, N. Y.
Bebell & Bebell Color Laboratories, 108 W. 24th St., New York 11, N. Y.
Bechtold, C. B., Co., 920 Levick St., Philadelphia 11, Pa.
•Beck, Charles, Machine Corp., Church & Gulph Roads, King of Prussia, Pa.
Beck, Clifford A., & Son, 482 West Broadway, New York 12, N. Y.
Beck Engraving Co., Inc., The, 105 S. Seventh St., Philadelphia 6, Pa.
Becker & Becker Assoc., 375 Park Ave., New York 22, N. Y.
Beckfield Rotary Vacuum Blower Co., 72 First Ave., Pittsburgh 22, Pa.
Bee Chemical Co., 2700 E. 170th St., Lansing, Ill.
Behr-Manning Co., 6102 Regan St., Troy, N. Y.
Beier & Co., 409 S. Green St., Chicago 7, Ill.
Bel-Art Products, Pequannock, N. J.
Belding Corticelli Industries, 1407 Broadway, New York 18, N. Y.
Belilove Co., 420 Market St., San Francisco 11, Calif.
Bell Box Co., 468 West Broadway, New York 12, N. Y.
Bell, Edwin, Cooperage Co., S. 17th St., Pittsburgh 3, Pa.
Bell Fibre Products Corp., Marion, Ind.
Bell Machine Co., The, 123 Jackson St., Oshkosh, Wis.
Bellamy, J. B., & Co., 1330 Egbert Ave., San Francisco 24, Calif.
Bellen Co., 1923 W. Armitage Ave., Chicago 22, Ill.
•Bell-Mark Corp., 37 West St., Bloomfield, N. J.
Bemis Bro. Bag Co.
General Offices, 111-H N. Fourth St., St. Louis 2, Mo.
Air Formed Products Corp., Sub., Haines St. Extension, Nashua, N. H.
Bemiss-Jason Corp., Bay Road at Douglas, Redwood City, Calif.
Benjamin, E. Burton, Assoc., 104 S. Michigan Ave., Chicago 3, Ill.
Ben-Mont, The Dow Chemical Co., Dobeckmun Div., Ben-Mont Ave., Bennington, Vt.
Benner Box Co., Inc., N.W. 28th St. & LeJeune Rd., Miami 48, Fla.
Bennett Industries, Inc., 110 Washington St., Peotone, Ill.
Bennett Products, Inc., 121 Loomis St., Rockford, Ill.
Bensing Bros. & Deeney, Products of General Printing Ink Co., 750 Third Ave., New York 17, N. Y.
Berger, Alan, 128-32–236th St., Laurelton 22, N. Y.
Berger & Gorin, Inc., 151 W. 26th St., New York 1, N. Y.
Berger-Rivenburgh Displays, 469 E. Ohio St., Chicago 11, Ill.
Berk, O., Co., 27-49 Haynes Ave., Newark 12, N. J.
Berkowitz, Leon L., Co., 1317 Filbert St., Philadelphia 7, Pa.
Berles Carton Co., Inc., 86 Fifth Ave., Paterson 4, N. J.
Berlin & Jones Co., Inc., 601 W. 26th St., New York 1, N. Y.
Berman Bros., Inc., 1501 S. Laflin St., Chicago 8, Ill.
Bernard Plastics Molding Corp., 38-40 Tenth St., Long Island City 1, N. Y.
Bernard-Edward Co., 5252 S. Kolmar Ave., Chicago 25, Ill.
Bernardin Bottle Cap Co., Inc., 2201 W. Maryland St., Evansville 12, Ind.
Bernard's Laboratories, Inc., 2619 Colerain Ave., Cincinnati 11, Ohio
Bernhard, Lucian, Studio, 36 Central Park S., New York 19, N. Y.
Berni, Alan, & Associates, Inc., 733 Third Ave., New York 17, N. Y.
Bertel's Metal Ware Co., Inc., 685 Rutter Ave., Kingston, Pa.
Best Paper Box Co., Inc., The, 2021-33 W. Willow St., Chicago 47, Ill.
Bestcraft Products Co., Inc., 626 Broadway, New York 12, N. Y.
Bestpak, Inc., Superior Drive, Natick, Mass.
Bethlehem Steel Co., 701 E. Third St., Bethlehem, Pa.
Better Containers Mfg. Co., 2646 W. Madison St., Chicago 8, Ill.
Better Packages, Inc., 252 Canal St., Shelton, Conn.
Better Packaging Advisory Council, 12 E. 41st St., New York, N. Y.
Bettis, H., Div., The Greif Bros. Cooperage Corp., 1043 Muskingum Ave., Zanesville, Ohio
Bevan, William W., Co., Inc., 68 Vine St., Everett 49, Mass.
Beyer, Dick, 511 Fifth Ave., New York 17, N. Y.
Bicknell & Fuller Paper Box Co., 50 Chardon St., Boston 14, Mass.
Bielefeld Studios, Inc., 35 E. Wacker Drive, Chicago 1, Ill.
Big Joe Mfg. Co., Inc., 900 W. Jackson Blvd., Chicago 7, Ill.
Bigelow-Garvey Lumber Co., 325 W. Huron St., Chicago 10, Ill.
Bin-Dicator Co., The, 13946-128 Kercheval Ave., Detroit 15, Mich.
Biner-Ellison Mfg. Co., 1101 N. Main St., Los Angeles 12, Calif.
Bingham Bros. Co., 406 Pearl St., New York, N. Y.
Binghamton Container Co., Inc., 28 Crandall St., Binghamton, N. Y.
Bird & Son, Inc., Washington St., East Walpole, Mass.
Birmingham Paper Co., 2110 S. Fifth Ave., Birmingham 3, Ala.
Bischoff Chemical Corp., 220 Miller Road, Hicksville, N. Y.
Bishop, Robert B., Inc., 168 N. Clinton St., Chicago 6, Ill.
Bishop, William, Co., 2449 N. Naomi St., Burbank, Calif.
Bisler, G. A., Inc., Fifth & Browne Sts., Philadelphia 23, Pa.
•Bivans Corp., 2431 Dallas St., Los Angeles 31, Calif.
Bjorksten Research Laboratories, P.O. Box 265, Madison 1, Wis.
•Black-Clawson Co., The, Dilts Div., 46 N. First St., Fulton, N. Y.
•Black-Clawson Co., The, Hale & Kullgren Plastics Dept., 613 E. Tallmadge Ave., Akron 10, Ohio
Black Products Co., 13513 So. Calumet Ave., Chicago 27, Ill.
Blake, Moffitt & Towne, 599 Eighth St., San Francisco 19, Calif.
Blank, Arthur, & Co., Inc., 38 Cummington St., Boston 15, Mass.
Bleier, Milton A., Corp., 251 Fifth Ave., New York 16, N. Y.
Bleyer, Alfred, & Co., Inc., 58-77–57th St., Maspeth 78, N. Y.
Blickman, S., Inc., 536 Gregory Ave., Weehawken, N. J.
•Bliss, E. W., Co., 1375 Raff Road S.W., Canton 10, Ohio
Blocksom & Co., Fifth & Canal Sts., Michigan City, Ind.
Blod, Francis, Design Associates, Inc., 1 E. 53rd St., New York 22, N. Y.
Blonder, Howard, & Assoc., 8353 Second St., Downey, Calif.
Blossom Mfg. Co., Inc., 2337 McDonald Ave., Brooklyn 23, N. Y.
Blue Cross Laboratories, 7401 Varna Ave., No. Hollywood, Calif.
Blue Grass Cooperage Co., Highland Park, Louisville, Ky.
Blum Folding Paper Box Co., Inc., Valley Stream, N. Y.
Blumenthal, Margaret M., 10 W. 93rd St., New York 25, N. Y.
Bobst, J., & Fils, S.A., Lausanne 16, Switzerland
Bock Enterprises, Inc., 25 Prospect St., Newark 5, N. J.
Bock, Frank, 270 Lafayette St., New York 12, N. Y.
Bodinson Manufacturing Co., 2401 Bayshore Blvd., San Francisco 24, Calif.
•Bodolay, Stephen, Inc., 77 Warehouse St., Springfield 8, Mass.
Bogert & Hopper, Inc., 101 W. 31st St., New York 1, N. Y.
Boice Folding Box Co., 4234 Ogden St., Philadelphia 4, Pa.
Boise Cascade Corp., Multiwall Bag Operations, Ames Harris Neville Co., 2603 Eighth St., Berkeley 10, Calif.
Boise Cascade Corp., Paper Div., P. O. Box 500, Wallula, Wash.
Boise Cascade Container Corp., P. O. Box 300, Wallula, Wash.
Boise Cascade Kraft Corp., P. O. Box 500, Wallula, Wash.
•Boler Petroleum Co., Inc., 119 Coulter Ave., Ardmore, Pa.
Bolta Products Div., The General Tire & Rubber Co., 70 Garden St., Lawrence, Mass.
Bo-Mer Mfg. Co., Inc., 40-42 Washington St., Auburn, N. Y.
Bond Adhesives Co., 120 Johnston Ave., Jersey City 3, N. J.
•Bond Crown & Cork Div., Continental Can Co., Inc., 1819 N. Major Ave., Chicago 39, Ill.
Bonded Scale & Machine Co., 16 Bellevue Ave., Columbus 7, Ohio
Bonder Glass & Closure Co., Inc., 37 Bogart St., Brooklyn 6, N. Y.
•Bondware Div., Continental Can Co., Inc., 349 Oraton St., Newark 4, N. J.
Bonny Box Co., Inc., 202 E. 19th St., New York 3, N. Y.
Bonny Mfg. Corp., 146 Main St., Maynard, Mass.
•Bon-R Reproductions, Inc., 265 Madison Ave., New York, N. Y.
Boone Box Co., Inc., 1 Progress Blvd., Louisville, Ky.
Boonton Molding Corp., 300 Myrtle Ave., Boonton, N. J.
Bopp-Decker Plastics, Inc., 677 S. Eton Rd., Birmingham, Mich.

Borden Chemical Co., The, 350 Madison Ave., New York 17, N. Y.
Boren Industrial Designers, 1335 Highland Ave., Abington, Pa.
Borkland Laboratories, 803 Quarry Rd., Marion, Ind.
Borkland Manufacturing Co., 803 Quarry Rd., Marion, Ind.
•Bostitch, Inc., Briggs Drive, East Greenwich, R. I.
Boston Envelope Co., 297 High St., Dedham, Mass.
Bostrom Corp., 133 W. Oregon St., Milwaukee 4, Wis.
Bostwick Laboratories, Inc., 706 Bostwick Ave., Bridgeport 5, Conn.
Bosworth & Co., 1330 Observatory Dr., Cincinnati 8, Ohio
Bourbon Cooperage Co., Box 186, Campbellsville, Ky.
Bowater Paper Co., Inc., The, 250 Park Ave., New York 17, N. Y.
Bowater Paper Corp. Ltd., Knightsbridge, London S.W.1, England
Bowater-Eburite Ltd., Knightsbridge, London S.W.1, England
Bowser-Morner Testing Laboratories, Inc., 141 Bruen St., Dayton 1, Ohio
Box Shop, Inc., The, 373 Lexington Ave., New Haven 13, Conn.
Boxcraft Paper Box Co., 1207 Kirkham St., Oakland 7, Calif.
Boxmakers, Inc., Westfield Industrial Park, Westfield, Mass.
Boyertown Packaging Service Corp., 315 E. Second St., Boyertown, Pa.
Brabender, C. W., Instruments, Inc., 50 E. Wesley St., So. Hackensack, N. J.
Bracamonte, R. M., & Co., 160 Spear St., San Francisco 5, Calif.
Bracy & Bracy, 1030 Euclid Ave., Cleveland 15, Ohio
Braden-Sutphin Ink Co., The, 3650 E. 93rd St., Cleveland 5, Ohio
Bradford Novelty Co., Inc., 760 Main St., Cambridge 52, Mass.
Bradford, W. J., Paper Co., 3742 S. Ashland Ave., Chicago 9, Ill.
•Bradley Associates, Inc., 1656 N. Damen Ave., Chicago 47, Ill.
Bradley, Dick, Co., P. O. Box 2212, Nashville 14, Tenn.
•Bradley & Gilbert Div., Standard Packaging Corp., 640 Seventh St., Louisville, Ky.
Bradley-Sun Div., American Can Co., U. S. Route 22, Union, N. J.
Bradley & Vrooman Co., 2629 S. Dearborn St., Chicago 16, Ill.
Bradner Smith & Co., 333 S. Desplaines St., Chicago 7, Ill.
Brady Conveyors Corp., The, 4244 Dempster St., Skokie, Ill.
Brady, W. H., Co., 727 W. Glendale Ave., Milwaukee 9, Wis.
Brainard Steel Div., Sharon Steel Corp., Larchmont Ave., Warren, Ohio
Brand, Ruth, 1414 Millwood Lane, No. Merrick, N. Y.
Brandau Craig Dickerson Co., 304 Tenth Ave., S., Nashville 3, Tenn.
Brandwell Sales Corp., 40-42 E. 19th St., New York 3, N. Y.
Brauer, Fred J., Inc., 245 E. 60th St., New York 22, N. Y.
Braun-Crystal Mfg. Co., Inc., 64-20 Admiral Ave., Middle Village 79, N. Y.
Braun-Hobar Corp., 12132 W. Capitol Dr., Milwaukee 10, Wis.
Braun, W., Co., 300 N. Canal St., Chicago 6, Ill.
Breaker Confections, Inc., 3005 W. Carroll St., Chicago 12, Ill.
Brecknell, Dolman & Rogers, Ltd., Pennywell Road, Bristol 5, England
Brett Lithographing Co., 47-07 Pearson Place, Long Island City 1, N. Y.
Brewer & Kriet, 6245 S. Princeton Ave., Chicago 21, Ill.
Brewster Enterprises, Inc., 20 Greenleaf St., Rochester 9, N. Y.
Brick & Ballerstein, Inc., 5-22—46th Ave., Long Island City 1, N. Y.
Bridgeport Brass Co., 30 Grand St., Bridgeport 2, Conn.
Bridgeport Moulded Products, Inc., 75 King's Highway Cut Off, Fairfield, Conn.
Bridgeport Paper Box Co., 304 Kossuth St., Bridgeport 1, Conn.
Brilhart Plastics Corp., Old Country Rd., Mineola, N. Y.
Brilmayer, E. W., Laboratories, Inc., 86 Fulton St., New York 38, N. Y.
Bristol Co., The, Bristol Rd., Waterbury 20, Conn.
Bristol Paper Box Co., Inc., 275 Bonham Road, Bristol, Va.
Bristol Paper Products, Inc., 25-25 Borden Ave., Long Island City 1, N. Y.
Britel Products, Inc., 102/106 Straight St., Paterson 1, N. J.
British Cellophane Ltd., 9 Henrietta Pl., London, W. 1, England
British Rayophane Ltd., 11 New Fetter Lane, London E.C. 4, England
Broadstreet Paper & Packaging Supply, 88 Broad St., Boston 10, Mass.
Brockton Contract Packaging, 109 N. Montello St., Brockton 17, Mass.
Brockton Plastics, Inc., 13 Monument St., Brockton, Mass.
Brockway Glass Co., Inc., Wood St., Brockway, Pa.
Bro-Dart Industries, 56 Earl St., Newark 8, N. J.
Brooks Paper Co., 400 Security Bldg., St. Louis 2, Mo.
Brooks & Porter, Inc., 304 Hudson St., New York 13, N. Y.
Brothers Paper Box Co., 1600 E. 22nd St., Sioux City 5, Iowa
Brown & Bailey Co., 417 N. Eighth St., Philadelphia 23, Pa.
Brown Co., 150 Causeway St., Boston 14, Mass.
•Brown Filling Machine Co., Inc., Sub. Sundstrand Corp., P. O. Box 452, Ann Arbor, Mich.
Brown, K. G., Mfg. Co., Inc., Wickham Ave., Mattituck, N. Y.
Brown Machine Co., Inc., 110 Pearson St., Beaverton, Mich.
Brown, W. G., Pallet Co., P.O. Box 1311, Jacksonville, Texas
•Brown-Bridge Mills, Inc., The, E. Water St., Troy, Ohio
Brownie Mfg. Co., 261 Broadway, New York 7, N. Y.
Brownsville Paper Co., Brownsville, N. Y.
Bruce Carton Co., Inc., 3400 Chelsea Ave., Memphis 8, Tenn.
Bruce Molded Plastic Products, Inc., 25 Boyd St., Pittsburgh 17, Pa.
Brunsing & Sons, Inc., 260 California St., San Francisco 11, Calif.
Brutier Products Co., Inc., 1615 Paterson Plank Road, Secaucus, N. J.
Bryant, Jerry, Studios, 920 N. Michigan Ave., Chicago 11, Ill.
Bryce Packaging, Inc., 207 Scott St., Memphis 12, Tenn.
Buck Glass Co., Div. Knox Glass, Inc., 841 E. Fort Ave., Baltimore 30, Md.
Buckeye Molding Co., 213 S. Third St., Miamisburg, Ohio
Buckeye Stamping Co., 555 Marion Rd., Columbus 7, Ohio
Bud-Wil Industries, 5415 Josephine St., Lynwood, Calif.
Buffalo Lithograph Co., Inc., 1200 Niagara St., Buffalo 13, N. Y.
Buffington, F. H., Co., 134 Thurbers Ave., Providence 3, R. I.
Bufkor, Inc., 588 Monroe St., Buffalo 11, N. Y.
Builders Sheet Metal Works, Inc., 108 Wooster St., New York 12, N. Y.
Bulkley Dunton & Co., 295 Madison Ave., New York 17, N. Y.
Bulldog Pallet Co., 35785 Haley St., Newark, Calif.
Bulman, E. O., Mfg. Co., Inc., 1650 McReynolds Ave. N.W., Grand Rapid 2, Mich.
•Bunn, B. H., Tying Machine Co., 7605 S. Vincennes Ave., Chicago 20, Ill.
Bunn Packaging Machinery Co., 7602 S. Greenwood Ave., Chicago 20, Ill.
Burd & Fletcher Co., 321 W. Seventh St., Kansas City 10, Mo.
•Burdick & Son, Inc., 72 Hamilton St., Albany 1, N. Y.
Bureau D'Etudes Techniques F. Tschumi, ing. S.I.A., Vevey, Switzerland
Burgess Fastening Co., 1220 W. Ninth St., Cleveland 13, Ohio
Burgess & Why Corp., 4045 Ridge Ave., Philadelphia 29, Pa.
Burkart, F., Mfg. Co., 4900 N. Second St., St. Louis 7, Mo.
Burlington Molding Corp., Belmont Road, Burlington, N. C.
Burlington Ribbon Mills, 303 Fifth Ave., New York 16, N. Y.
Burnett, R. L., Co., 815-817 E. Commerce St., San Antonio 6, Texas
Burros Bag Co., Inc., 4-12 Water St., Brooklyn 1, N. Y.
•Bursak Packaging Machinery Corp., 146 N. Railroad St., Jackson, Wis.
Burt, F. L., Co., 1144 Howard St., San Francisco 3, Calif.
Burt, F. N., Co., Inc., 2345 Walden Ave., Buffalo 25, N. Y.
Burt Machine Co., 401-03 E. Oliver St., Baltimore 2, Md.
Burton, John, Machine Corp., 420 Market St., San Francisco 11, Calif.
Burton Packaging Co., Inc., 274 Morgan Ave., Brooklyn 11, N. Y.
Busch, V. W., Mfg. Co., 10470 Rushton Rd., South Lyon, Mich.
Buschman, E. W., Co., The, 4497 Clifton Ave., Cincinnati 32, Ohio
Buser, Inc., 28 Ryle Ave., Paterson 20, N. J.
Busse, Robert, & Co., Inc., 64 E. Eighth St., New York 3, N. Y.
Butler Automatic Machine, Inc., 205 Broadway, Cambridge 39, Mass.
Butler & Ferrigno Lithographic Co., Inc., 5223 Belfield Ave., Philadelphia 44, Pa.
Butterfield-Barry Co., Inc., The, 800 Huyler St., Teterboro, N. J.
Butterfield, T. F., Inc., 52 Rubber Ave., Naugatuck, Conn.

C

C & G Packaging, Inc., 121 McDonald St., Midland, Mich.
C & M Manufacturing Co., 112 Point St., Providence 3, R. I.
CESCO, 4025 Sebastopol Hwy., Santa Rosa, Calif.
COSECO, 8350 Santa Monica Blvd., Los Angeles 46, Calif.
CPS Mfg. Co., 5051 S. Western Blvd., Chicago 9, Ill.
Cadillac Label Co., 221 W. Butler St., Kalamazoo, Mich.
Cadillac Plastic & Chemical Co., 15111 Second Ave., Detroit 3, Mich.
Cadillac Products, Inc., 7000 E. 15 Mile Road, Warren, Mich.
Cady, E. J., & Co., 630 N. Harlem Ave., River Forest, Ill.
Cahill, J. D., Co., Hampton, N. H.
Calcasieu Paper Co., 808 W. Bay St., Jacksonville 3, Fla.
California Art & Engraving Co., 2121 Allston Way, Berkeley, Calif.

California Ink Co., Inc., The, 545 Sansome St., San Francisco 11, Calif.
Calig Steel Container, Inc., 27 Tecumseh St., Pittsburgh 7, Pa.
Calig Steel Drum Co., 27 Tecumseh St., Pittsburgh 7, Pa.
Callanan, J. A., Co., 118 S. Clinton St., Chicago 6, Ill.
Calmar, Inc., 6820 McKinley Ave., Los Angeles 1, Calif.
Calnail, Inc., 328 N.E. Third Ave., Visalia, Calif.
Cal-Plastics, 590 York St., San Francisco 10, Calif.
Calumet Carton Co., Homewood, Ill.
Calumet Mfg. Co., Inc., 565 Fifth Ave., New York 17, N. Y.
Calvert Lithographing Co., The, 2100 Grand River Ave., W., Detroit 1, Mich.
Cal-Western Mfrs., 3023 Coolidge Ave., Los Angeles 39, Calif.
Cambridge Instrument Co., Inc., 420 Lexington Ave., New York, N. Y.
Cambridge Paper Box Co., 196 Broadway, Cambridge 41, Mass.
Camco Sales, Tite-Cap Machine Div., 5105 S.W. 45th Ave., Portland 1, Ore.
•Cameo Die & Label Co., 154 W. 14th St., New York 11, N. Y.
Cameron, Inc., 4611 N. Clark St., Chicago 40, Ill.
•Cameron Machine Co., Franklin Road, Dover, N. J.
Campbell Box & Tag Co., 903 S. Main St., South Bend 23, Ind.
•Campco Div., Chicago Molded Products Corp., 2717 N. Normandy Ave., Chicago 35, Ill.
Can Manufacturers Institute, Inc., 821—15th St., N.W., Washington, D. C.
Canada Foils, Ltd., 1891 Eglinton Ave., E., Toronto 16, Ont., Canada
Canada Glazed Papers Ltd., 2131 Lawrence Ave. E., Scarborough, Ont., Canada
Canada Paper Co., 2300 Sun Life Bldg., Montreal 2, Que., Canada
Canada Paper "Wholesale" Ltd., 153 Dufferin St., Toronto 3, Ont., Canada
Canadian Industries Ltd., P.O. Box 10, Montreal 2, Que., Canada
Canadian Technical Tape Ltd., 455 Cote Vertu Road, Montreal 9, Que., Canada
•Canco Div., American Can Co., 100 Park Ave., New York 17, N. Y.
•Canning Machinery Div., FMC Corp., 333 W. Julian St., San Jose 8, Calif.
Canning Machinery & Supplies Assn., 4630 Montgomery Ave., Washington 14, D. C.
Can-Pro Corp., 19 E. McWilliams St., Fond du Lac, Wis.
Canton Containers, Inc., 1101 Ninth St. S. E., Canton 7, Ohio
Capital City Container Co., Inc., Tivoli & N. Pearl Sts., Albany 7, N. Y.
Capitol Packaging Co., 1501 N. 31st Ave., Melrose Park, Ill.
Caral Packaging Machinery, Inc., 579 Cleveland Ave., Albany 10, Calif.
•Carbert Mfg. Co., Div. Pneumatic Scale Corp., Ltd., 82 Newport Ave., Quincy, Mass.
Carbona Products Co., 30-50 Greenpoint Ave., Long Island City 1, N. Y.
Cardel Enterprises, Ltd., Bethridge Rd., Rexdale, Toronto, Ont., Canada
Cardinal Boxes, Inc., 410 N. Franklin St., Philadelphia 23, Pa.
Cardinal Containers, 800 Fair Oaks Ave., Oak Park, Ill.
Cardinal Flower & Novelty Co., 37 E. 19th St., New York 3, N. Y.
Cardinal Lithograph Co., 2875 W. Ninth St., Los Angeles 6, Calif.
Cardinal Mills, Inc., Pratt Oval, Glen Cove, N. Y.
Carey Press Corp., 406-426 W. 31st St., New York 1, N. Y.
Cargo Packers, Inc., 88th St. & 73rd Ave., Glendale 27, N. Y.
Carle & Montanari, Inc., 95 Temple Ave., Hackensack, N. J.
Carlisle, A., & Co., 645 Harrison St., San Francisco 11, Calif.
Carlon Products Corp., Plastic Industrial Products Div., 363 Highland Ave., Somerville 44, Mass.
Carlson, John P., Inc., 420 Carroll St., Brooklyn 15, N. Y.
Carnation Converters, Inc., 20-22—130th St., College Point 56, N. Y.
Carney & McReynolds, 28 E. Jackson Blvd., Chicago 4, Ill.
Carolina Paper Board Corp., Gardner Ave., Charlotte, N. C.
Carpenter Container Corp., Div. Greif Bros. Cooperage Corp., 175 E. Hoffman Ave., Rahway, N. J.
Carrier Conveyor Corp., 211 N. Jackson St., Louisville 2, Ky.
Carr-Lowrey Glass Co., 2201 Kloman St., Baltimore 30, Md.
Carroll Box & Pallet Co., 4245 E. Sheila St., Los Angeles 23, Calif.
Carry-Pack Co., Ltd., 9525 W. Irving Park Rd., Schiller Park, Ill.
Carse Electric Corp., 1044 Broadway, Albany 4, N. Y.
Carter Engineering Co., 123 N. Hazel St., Danville, Ill.
Carter & Galantin, Inc., 710 W. Jackson St., Chicago 3, Ill.
Carter, Joseph, 4855 W. Berenice Ave., Chicago 41, Ill.
Carton Craftsmen Div., St. Regis Paper Co., 5701 W. Ogden Ave., Cicero 50, Ill.
Carton Label & Lithograph Co., 200 Broadway, San Francisco 11, Calif.
Carton Products Co., 1914 W. 14th St., Chicago 8, Ill.
Carton Service, Inc., Franklin Ave., Shelby, Ohio
Casco Paper Box Co., 68 Cross St., Portland 3, Maine
Cashin, Inc., P.O. Box 1954, Albany 5, N. Y.
Casler, Arvid E., 1174 Webster Lane, Des Plaines, Ill.
Caspers Tin Plate Co., 4100 W. 42nd St., Chicago 32, Ill.
Casselman, T. & E., Inc., 356 W. 18th St., New York 11, N. Y.
Castco, Inc., 36-35—36th St., Long Island City 6, N. Y.
Casting Masters, Inc., Appliance Div., 2640 W. Wilcox St., Chicago 12, Ill.
Castle Offset Printing Corp., 10 N. Foster Ave., Norwalk, Ohio
Castle Plastics, Inc., 141 E. 44th St., New York 17, N. Y.
Catalin Corp. of America, One Park Ave., New York 16, N. Y.
Catty, H. D., Corp. of New York, 237 Main St., Norwalk, Conn.
Cayne, Albert H., Equipment Corp., 73 Spring St., New York 12, N. Y.
Cee-Jay Extruders, Inc., 29 Denton Ave., New Hyde Park, N. Y.
•Celanese Plastics Co., Div. Celanese Corp. of America, 744 Broad St., Newark 2, N. J.
•Celanese Polymer Co., Div. Celanese Corp. of America, 744 Broad St., Newark 2, N. J.
•Cel-Fibe Div., Personal Products Corp., Milltown, N. J.
Cello Bag Co., Inc., 4550—38th Ave., S.W., Seattle 6, Wash.
Cello-Masters, Inc., 1155 Randall Ave., New York 59, N. Y.
Cello-Pack, Inc., 111 Dingens St., Buffalo 6, N. Y.
Cello Packaging Co., 935 American St., San Carlos, Calif.
Cellophane Bag & Printing Corp., 173 Lott Ave., Brooklyn 12, N. Y.
Cellotape & Tag Printers, 4019 Transport St., Palo Alto, Calif.
Cellu Fibre Can Corp., 45-10—94th St., Elmhurst 73, N. Y.
•Cellu-Craft Products Corp., 1401 Fourth Ave., New Hyde Park, N. Y.
•Celluplastics, Inc., Sub. Brockway Glass Co., Inc., 24 Commerce St., Newark 2, N. J.
Cellusuede Products, Inc., 500 N. Madison St., Rockford, Ill.
Celon Co., The, Div. Thatcher Glass Mfg. Co., Inc., P. O. Box 311, Muscatine, Iowa
Celotex Corp., The, 120 S. LaSalle St., Chicago 3, Ill.
Celwa Products Co., 72 Spring St., New York 12, N. Y.
Center for Research in Marketing, RD #2, Peekskill, N. Y.
•Central Can Co., Inc., 3204 S. Kilbourn Ave., Chicago 23, Ill.
Central Carton Co., The, 920 Summer St., Cincinnati 4, Ohio
Central Design & Development Co., Div. Technimatic Industries, Inc., 65 Flatbush Ave., Brooklyn 17, N. Y.
Central Lithograph Co., The, 1278 W. 58th St., Cleveland 2, Ohio
Central Ohio Paper Co., The, 226 N. Fifth St., Columbus 16, Ohio
Central Paper Box Co., 225 E. Grant St., Lancaster, Pa.
Central Paper Box Co., 226 W. Columbia Ave., Philadelphia 22, Pa.
Central Paper Co., 328 Manitowoc St., Menasha, Wis.
Central Paper Co., Inc., 2400 Lakeshore Drive, Muskegon, Mich.
Central Plastic Corp., 123 Central St., Leominster, Mass.
Central States Can Corp., The, 1801 Harsh Ave., Massillon, Ohio
Central States Paper & Bag Co., Inc., 5221 Natural Bridge Ave., St. Louis 15, Mo.
Central Supply Co., P.O. Box 797, Milwaukee 10, Wis.
Central Waxed Paper Co., Div. St. Regis Paper Co., 5100 W. Roosevelt Rd., Chicago 50, Ill.
Central Wire Frame Co., 218 E. 26th St., New York 10, N. Y.
Centric Clutch Co., P. O. Box 175, Woodbridge, N. J.
Century Engineering Co., Inc., 4716 W. Lake St., Chicago 44, Ill.
Century Plastic Co., Sawyer Passway, Fitchburg, Mass.
Century Printing Ink Co., 224 S. Van Brunt St., Englewood, N. J.
Ceragraphic, Inc., 171 Newman St., Hackensack, N. J.
Ceramic Decorating Co., 4651 Sheila St., Los Angeles 22, Calif.
Cerutti Presses of America, Inc., 121 Prospect St., Westfield, N. J.
Chaffee Brothers Co., Main St., Oxford, Mass.
Chaffee, Ralph, & Co., 2360 Market St., San Francisco 14, Calif.
Chain Belt Co., 4701 W. Greenfield Ave., Milwaukee 1, Wis.
Challenge Machinery Co., The, 19 N. First St., Grand Haven, Mich.
Challenger Art & Design Service, 132 Cleveland Ave. N.W., Camden, Ark.
Chambers-Storck Co., Inc., The, 751 N. Main St., Norwich, Conn.
Champion-International Co., 38 Prospect St., Lawrence, Mass.
Champion Papers, Inc., Knightsbridge, Hamilton, Ohio
•Champlain Co., Inc., 146 Harrison Ave., Roseland, N. J.
•Champlain-Zapata Plastics Machinery Co., Kulick Rd., Caldwell, N. J.

Chanal Plastics Corp., 63-20 Austin St., Rego Park 74, N. Y.
Chandler Mfg. Co., Inc., The, 103 Old Colony Ave., East Taunton, Mass.
Chandler & Price Co., The, 6000 Carnegie Ave., Cleveland 3, Ohio
Chapman, Dave, Inc., Industrial Design, 35 E. Wacker Dr., Chicago, Ill.
Chase Bag Co., 355 Lexington Ave., New York 17, N. Y.
Chase Companies, 47 East 19th St., New York 3, N. Y.
Chase Equipment Corp., Div. C. W. Logeman Co., 633 Bergen St., Brooklyn 38, N. Y.
Chase Products Co., 19th & Gardner Rd., Broadview, Ill.
•Chaspec Manufacturing Co., The, 342 W. Putnam Ave., Greenwich, Conn.
Chelsea Bottle Co., Inc., 239 Second St., Chelsea 50, Mass.
Chemical Enterprises, 757 Waveland Ave., Chicago 13, Ill.
Chemical & Pharmaceutical Industry Co., Inc., 90 W. Broadway, New York 7, N. Y.
Chemical & Power Products, Inc., 11 Broadway, New York 4, N. Y.
Chemical Producers Service, Inc., Cliff Road, Port Reading, N. J.
•Chemical Products Corp., King Philip Rd., East Providence 14, R. I.
Chemical Specialties Manufacturers Assn., Inc., 50 E. 41st St., New York 17, N. Y.
Chemicraft Corp., 351 W. 35th St., New York 1, N. Y.
Chem-Pack, Inc., 2261 Spring Grove Ave., Cincinnati 14, Ohio
Chesapeake Corp. of Va., West Point, Va.
Chicago Cardboard Co., 1240 N. Homan Ave., Chicago 53, Ill.
Chicago Carton Co., Div. Waldorf Paper Products Co., 4200 S. Pulaski Ave., Chicago 32, Ill.
Chicago Curled Hair Co., 2301 S. Paulina St., Chicago 8, Ill.
Chicago Gasket Co., 1271 W. North Ave., Chicago 22, Ill.
Chicago Mailing Tube Co., 327 N. Aberdeen, Chicago 7, Ill.
Chicago Metallic Mfg. Co., P.O. Box 396, Lake Zurich, Ill.
Chicago Mill & Lumber Co., 33 S. Clark St., Chicago 3, Ill.
Chicago Molded Products Corp., 1020 N. Kolmar Ave., Chicago 51, Ill.
Chicago Paper Box Co., 732 N. Morgan St., Chicago 22, Ill.
Chicago Paper Co., 801 S. Wells St., Chicago 7, Ill.
Chicago Paper Tube & Can Co., 137-141 S. Albany Ave., Chicago 12, Ill.
Chicago Printed String Co., 2300 Logan Blvd., Chicago 47, Ill.
Chicago Show Printing Co., 2635 N. Kildare Ave., Chicago 39, Ill.
Chicago Steel & Wire Co., 10257 Torrence Ave., Chicago 17, Ill.
Chicago Wood & Plastic Products, 4201 Irving Park Blvd., Chicago 41, Ill.
Chicopee Mfg. Corp., 2 Ford Ave., Milltown, N. J.
Chinkes, Sam, & Assoc., 95 Park Terrace E., New York 34, N. Y.
Chipman, Richmond Lane, Jr., 30-A N. Mountain Ave., Montclair, N. J.
Chippewa Paper Products Co., Inc., 2425 S. Rockwell St., Chicago 8, Ill.
Chippewa Plastics Co., Div. Rexall Drug & Chemical Co., 1701 First Ave., Chippewa Falls, Wis.
Chirpe, Rodney, 185 N. Wabash Ave., Chicago 1, Ill.
Chisholm-Moore Hoist Div., Columbus McKinnon Chain Corp., Fremont Ave., Tonawanda, N. Y.
Chisholm-Ryder Co., Inc., College & Highland Aves., Niagara Falls, N. Y.
•Chisholm-Ryder Co. of Pa., Inc., Blettner Ave., Hanover, Pa.
Chisholm Sales & Engineering Co., 602 Erie Ave., Niagara Falls, Ont., Canada
Chopp Printing Specialties, Inc., 350 Hudson St., New York 14, N. Y.
Cimastra Div., The Cincinnati Milling Machine Co., 4701 Marburg Ave., Cincinnati 9, Ohio
•Cincinnati Box & Partition Co., The, 1110 Richmond St., Cincinnati 3, Ohio
Cincinnati Container Co., 2833 Spring Grove Ave., Cincinnati 25, Ohio
Cincinnati Industries, Inc., 515 Station Ave., Cincinnati 15, Ohio
Cincinnati Lathe & Tool Co., Oakley St., Cincinnati 9, Ohio
Cincinnati Molding Co., 2037 Florence Ave., Cincinnati 6, Ohio
•Cin-Made Corp., The, 800 E. Ross Ave., Cincinnati 17, Ohio
Circle Design & Mfg. Corp., 18 Bland Ave., Emerson, N. J.
Cities Service Oil Co., 60 Wall Tower, New York 5, N. Y.
•Clamco Div., Cleveland-Detroit Corp., 5400 Brookpark Road, Cleveland 29, Ohio
•Claremont Flock Corp., 169 Main St., Claremont, N. H.
Claremont Pigment Dispersion Corp., 39 Powerhouse Rd., Roslyn Heights, N. Y.
Claremould Plastics Co., 200 Wright St., Newark 5, N. J.
Clark Equipment Co., Industrial Truck Div., 24th St., Battle Creek, Mich.
Clark, George P., Co., 28 Canal St., Windsor Locks, Conn.
Clark, J. L., Mfg. Co., 2300 Sixth St., Rockford, Ill.
Clark Products, Inc., 825 W. Evergreen St., Chicago 22, Ill.
Clark Stek-O Corp., 1631 Dewey Ave., Rochester 15, N. Y.
•Clark-Aiken Co., The, Water St., Lee, Mass.
Clarke Can Co., Inc., E. York & Thompson Sts., Philadelphia 25, Pa.
ClarkPac, Inc., 414 Union Ave., Westbury, N. Y.
Claron Packaging Corp., 7457 St. Louis Ave., Skokie, Ill.
Clavell Bate & Nephews Ltd., Vulcan Works, Nelson, Lancs., England
Clay Printing Co., Inc., 500 Main Ave., N.W., Hickory, N. C.
Clayton Corp., 4205 Forest Park Blvd., St. Louis 8, Mo.
Clear View Bag Co., Inc., R.R. 2, Box 327J, Carmel, Ind.
Clearco Products Co., 165 W. 26th St., New York 1, N. Y.
Clearprint, Inc., 3639 Dyre Ave., New York 66, N. Y.
Clear-Vu Packaging Corp., 622-26 Broadway, New York 12, N. Y.
Cleveland Aerosol Packaging Corp., 9801 Harvard Rd., Cleveland 5, Ohio
•Cleveland Container Co., The, 6201 Barberton Ave., Cleveland 2, Ohio
Cleveland Crane & Engineering Co., The, Wickliffe, Ohio
Cleveland Vibrator Co., The, 2828 Clinton Ave., W., Cleveland 13, Ohio
Clifton Paper Board Sales Co., 1 Ackerman Ave., Clifton, N. J.
Climax Fibre Drum Co., Box 109, Carthage, N. Y.
Climax Mfg. Co., Climax St., Castorland, N. Y.
Climax Products Div., Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio
Clinch-Tite Corp., 20 E. Athens Ave., Ardmore, Pa.
•Clopay Corp., Clopay Square, Cincinnati 14, Ohio
•Closure Div., Standard Packaging Corp., 1200 Fullerton Ave., Chicago 14, Ill.
Closure Specialty Co., 5975 S. Western Ave., Los Angeles, Calif.
Closure Systems, 520 W. 36th St., New York 18, N. Y.
Closures, Inc., P.O. Box 711, Waterbury, Conn.
Cloud Machine Corp., 7455 N. St. Louis Ave., Skokie, Ill.
Clover Industries, Inc., 578-88 Young St., Tonawanda, N. Y.
Clowe, H. W., & Co., 128 Duncan Ave., Jackson 5, Miss.
Clupak, Inc., 530 Fifth Ave., New York 36, N. Y.
•Clybourn Machine Corp., 6479 N. Avondale Ave., Chicago 31, Ill.
Coast Packaging, Inc., 1717 Victory Blvd., Glendale 1, Calif.
•Coated Products, Inc., 275 Lincoln Blvd., Middlesex, N. J.
Coates Board & Carton Co., Inc., 70 Outwater Lane, Garfield, N. J.
Coating Products, Inc., 101 W. Forest Ave., Englewood, N. J.
Cobden Chadwick, Ltd., Century Works, Havelock St., Oldham, Lancs., England
Cochrane Chemical Co., Lloyd Road, Matawan, N. J.
Codd Paper Co., Inc., 420 Lexington Ave., New York 17, N. Y.
Coddington, E. D., Mfg. Co., 5024 N. 37th St., Milwaukee 9, Wis.
Coe, Norman, 115 Alexander St., Princeton, N. J.
Coes Knife Co., 72 Coes St., Worcester 3, Mass.
Cohoes Carrybag Co., Inc., 60 Olmstead St., Cohoes, N. Y.
Colburn, Harold E., 82 St. Paul St., Rochester 4, N. Y.
Colgate, Wm. Homer, P.O. Box 50, West Redding, Conn.
Collapsible Tube Mfrs. Council, 1125 Madison Ave., New York 28, N. Y.
Collett-Sproule Boxes Ltd., 1997 Kennedy Rd., Scarborough, Ont., Canada
Collier Mfg. Corp., Div. Warren Featherbone Co., Gainesville, Ga.
Collins, A. J., Mfg. Co., Inc., 4449 N. Lincoln Ave., Chicago 25, Ill.
Collins, H. Tom, 549 W. Washington, Chicago 6, Ill.
Collison Lee & Philippi, Inc., 6409 Beechmont Ave., Cincinnati 30, Ohio
•Colonial Applicator Co., 538 N. East Ave., Vineland, N. J.
Colonial Envelope Co., Inc., 61 Java St., Brooklyn 22, N. Y.
Colonial Kolonite Co., 2232 W. Armitage Ave., Chicago 47, Ill.
Colonial Label Co., 36 W. 15th St., New York 11, N. Y.
Colonial Moulded Plastics Co., Inc., Blackstone St., Wilkinsonville, Mass.
Colonial Plastics Mfg. Co., 2685 E. 79th St., Cleveland 4, Ohio
Color Craft Display Corp., 52-25 Barnett Ave., Long Island City 4, N. Y.
Color Process Co., Inc., 220–40th St., Philadelphia 4, Pa.
Color Reproductions, Inc., Garden State Road, Union, N. J.
Color Research Institute, 105 W. Adams St., Chicago 3, Ill.
Colora Printing Inks, Inc., 42-12–35th Ave., Long Island City 1, N. Y.
Colorcraft Products, Inc., 86 Willow St., Bridgeport 10, Conn.
Colorcraft Screening Co., 9103-09 Third Ave., No. Bergen, N. J.
Colorite Plastics, Inc., 50 California Ave., Paterson 3, N. J.
Colson Corp., The, Cedar & Pine Sts., Elyria, Ohio
Colt Packaging Machinery Co., 54 Washington Ave., Cranston 7, R. I.

•Colton, Arthur, Co., The, 3400 E. Lafayette Ave., Detroit 7, Mich.
Colt's Plastics Co., Inc., P.O. Box 507, No. Grosvenordale, Conn.
Columbia Basin Plastics Co., 5160 Vineland Ave., No. Hollywood, Calif.
•Columbia Box Board Mills, Inc., Chatham, N. Y.
Columbia Can Co., 59-27–54th St., Maspeth 78, N. Y.
Columbia Paper Products Corp., 2335 W. Franklin St., Baltimore 23, Md.
Columbian Rope Co., 309 Genesee St., Auburn, N. Y.
Columbus Paper Box Co., Inc., 338-352 W. Town St., Columbus 22, Ohio
Columbus Plastic Products, Inc., 1625 W. Mound St., Columbus 23, Ohio
Comac Engineering, Inc., 239 Mill St., Byram, Conn.
•Comet Industries, Inc., 9865 Franklin Ave., Franklin Park, Ill.
Comly-Gillam Carton Corp., G & Lycoming Sts., Philadelphia 24, Pa.
Commerce Chemical Corp., 1271 Avenue of the Americas, New York 20, N. Y.
Commerce Packaging Corp., 50 John St., Stamford, Conn.
Commercial Corrugated Container Corp., 50 Kent Ave., Brooklyn 11, N. Y.
Commercial Handling Equipment Co., 16244 James Couzens Hwy., Detroit 21, Mich.
Commercial Ink Corp., 627 Broadway, New York, N. Y.
Commercial Paste Co., Inc., The, 504 Buttles Ave., Columbus 15, Ohio
Commercial Plastics & Supply Corp., 630 Broadway, New York 12, N. Y.
Commonwealth Plastics Corp., 98 Adams St., Leominster, Mass.
Como Plastics, Inc., 2455 National Road, Columbus, Ind.
Compo Chemical Co., Inc., 125 Roberts Road, Waltham 54, Mass.
•Conapac Corp., 120 E. 13th St., New York 3, N. Y.
Conart Co., Inc., The, 240 Glen Head Road, Glen Head, N. Y.
Condes Corp., 5856 N. Port Washington Rd., Milwaukee 17, Wis.
Condon, Frank, Assoc., Inc., Eatons Neck, Northport, N. Y.
Conex Div., Illinois Tool Works, 1901 S. Mt. Prospect Rd., Des Plaines, Ill.
Congress Paper Box Co., 210 N. Wolcott Ave., Chicago 12, Ill.
Conneaut Can Co., The, Whitney Rd., Conneaut, Ohio
Connecticut Chemicals (Canada), Ltd., Curity Ave. & Hollinger Rd., Toronto, Ont., Canada
Connecticut Hard Rubber Co., The, 407 East St., New Haven 9, Conn.
Connecticut Plastic Products Co., Inc., 70 W. Liberty St., Waterbury 20, Conn.
Con-Serv Corp., Air-Pack Div., 344 W. Garvey St., Monterey Park, Calif.
•Consolidated Aluminum Corp., 1100 Richmond, Jackson, Tenn.
Consolidated Bag Corp., 3435 Melvale St., Philadelphia 34, Pa.
Consolidated Bag & Foil Corp., 561 Windsor St., Somerville, Mass.
Consolidated Baling Machine Co., 195-99 Sixth St., Brooklyn 15, N. Y.
Consolidated Box Co., Inc., 410 S. Packwood Ave., Tampa 6, Fla.
Consolidated Cork Corp., 4012 Second Ave., Brooklyn 32, N. Y.
•Consolidated Engravers Div., American-Marietta Co., 311 E. 12th St., Charlotte 1, N. C.
Consolidated Fruit Jar Co. of New Jersey, 62 Water St., New Brunswick, N. J.
Consolidated Lithograph Div., Somerville Ltd., 865 Hodge St., Montreal 9, Que., Canada
Consolidated Lithographing Corp., Carle Place, N. Y.
Consolidated Molded Products Corp., 329 Cherry St., Scranton 2, Pa.
Consolidated Mounting & Finishing Co., Inc., 50-10 Kneeland St., Elmhurst 73, N. Y.
•Consolidated Packaging Machinery Corp., 1400 West Ave., Buffalo 13, N. Y.
Consolidated Paper Box Co., 6 Vernon St., Somerville 45, Mass.
Consolidated Paper Box Co., 4281 Bandini Blvd., Los Angeles 23, Calif.
Consolidated Paper Co., 921 E. Elm Ave., Monroe, Mich.
Consolidated Paper Co., Inc., 170 N. 11th St., Brooklyn 11, N. Y.
Consolidated Water Power & Paper Co., P.O. Box 50, Wisconsin Rapids, Wis.
Constantine Paperboard Div., The Davey Co., Constantine, Mich.
Consumers Glass Co., Ltd., Canada Cement Co. Bldg., Phillips Sq., Montreal 2, Que., Canada
Container Corp. of America, 38 S. Dearborn St., Chicago 3, Ill.
•Container Equipment Corp., 78-88 Locust St., Bloomfield, N. J.
Container Laboratories, Inc., 112 W. Kinzie St., Chicago 10, Ill.
Container Research Corp., Westport, Conn.
Container Service Co., 5975 S. Western Ave., Los Angeles 47, Calif.
Container Stapling Corp., 100 S. 27th St., Herrin, Ill.
•Containerboard & Kraft Paper Div., Continental Can Co., Inc., 633 Third Ave., New York 17, N. Y.
Containers Machinery Co., 2815 Orchard Lane, Wilmette, Ill.
Continental Box Co., Inc., P.O. Box 1322, Houston 1, Texas
•Continental Can Co., Inc.
General Offices, 633 Third Ave., New York 17, N. Y.
•Bond Crown & Cork Div., 1819 N. Major Ave., Chicago 39, Ill.
•Bondware Div., 349 Oraton St., Newark 4, N. J.
•Containerboard & Kraft Paper Div., 633 Third Ave., New York 17, N. Y.
•Corrugated Container Div., 633 Third Ave., New York 17, N. Y.
•Flexible Packaging Div., Mt. Vernon, Ohio
•Folding Carton & Drum Div., 633 Third Ave., New York 17, N. Y.
•Hazel-Atlas Glass Div., 15th & Jacob Sts., Wheeling, W. Va.
•Metal Div., 633 Third Ave., New York 17, N. Y.
•Plastic Bottle & Tube Div., 2930 N. Ashland Ave., Chicago 13, Ill.
•White Cap Co., Div., 1819 N. Major Ave., Chicago 39, Ill.
Continental Decalcomania Co., Averill Ave., Sparta, Mich.
Continental Elastic Co., 90 Hatch St., New Bedford, Mass.
Continental Extrusion Corp., 30 Prince St., Brooklyn 1, N. Y.
Continental Filling Corp., 123 N. Hazel St., Danville, Ill.
Continental Folding Paper Box Co., Inc., River St., Ridgefield, N. J.
Continental Gin Co., 4500 Fifth Ave., S., Birmingham 2, Ala.
Continental Glass Co., 841 W. Cermak Road, Chicago 8, Ill.
Continental Packaging & Processing, Inc., 1950 N. Ruby St., Melrose Park, Ill.
Continental Paper Co., Industrial Ave., Ridgefield Park, N. J.
Continental Paper Products Co., P.O. Box 4116, Denver 9, Colo.
Continental Plastics Corp., 2934 W. Lake St., Chicago 12, Ill.
Continental Plastics of Oklahoma, 108 N.E. 48th St., Oklahoma City 5, Okla.
Continental Steel Corp., 1109 S. Main St., Kokomo, Ind.
•Contour Extrusion Co., 517 Fayette Ave., Mamaroneck, N. Y.
Contour Packaging Co., 3901 Main St., Manayunk, Philadelphia 27, Pa.
Contract Packaging Corp., Elizabeth St., W. Conshohocken, Pa.
Contract Packers, Inc., 2331–12th Ave., New York 27, N. Y.
Convair Instruments/Convair, Div. General Dynamics Corp., 3595 Frontier St., San Diego, Calif.
Converter Corp., 218 Willard St., Leominster, Mass.
Converters Ink Co., 1261 W. Elizabeth Ave., Linden, N. J.
Converters Machine Co., 239 Mill St., Byram, Conn.
Converters' Machinery & Controls, Inc., 12803 W. Silver Spring Dr., Butler, Wis.
Converters Service Co., 2344 E. 38th St., Los Angeles, Calif.
Conveyor Specialty Co., Inc., 27 Newport Ave., No. Quincy 71, Mass.
Conveyor Systems, Inc., 6451 Main St., Morton Grove, Ill.
Convoy, Inc., 3440 Navarre Road, S.W., Canton 6, Ohio
Cooper Carton Corp., 4343 S. Ashland Ave., Chicago 9, Ill.
Cooper, D. C., Co., 1467 S. Michigan Ave., Chicago 5, Ill.
Cooper Paper Box Div., Clarkson Press, Inc., 19 Hardwood Pl., Buffalo 10, N. Y.
Cooper, Peter, Corporations, Palmer St., Gowanda, N. Y.
Copeland Displays, Inc., 635 W. 23rd St., New York 11, N. Y.
Copy Papers, Inc., 4100 W. Schubert Ave., Chicago 39, Ill.
Coquillard Aluminum Works, Froges (Isere), France
Cordo Chemical Corp., 34 Smith St., Norwalk, Conn.
Cork Products Co., Inc., 239 Park Ave. S., New York 3, N. Y.
Corn Belt Adhesives, 1017 Fourth St., Council Bluffs, Iowa
Corn Products Sales Co., 717 Fifth Ave., New York 22, N. Y.
Cornelius, Theodore, 15 Park Row, New York 38, N. Y.
Cornell Paperboard Products Co., Div. St. Regis Paper Co., 1514 E. Thomas Ave., Milwaukee 1, Wis.
Corning Fibre Box Corp., Corning, N. Y.
Corning Glass Works, Corning, N. Y.
Corricut, Inc., One N. LaSalle St., Chicago 2, Ill.
Corro-Lith Corp., 44-35–21st St., Long Island City 1, N. Y.
Corrugated Adhesive & Combiner Consultants, Inc., 21 Goodale Circle, New Brunswick, N. J.
•Corrugated Container Div., Continental Can Co., Inc., 633 Third Ave., New York 17, N. Y.
Corrugated Coppage Machinery Co., 8 W. 40th St., New York 18, N. Y.
Corson Mfg. Co., 20-24 Michigan St., Lockport, N. Y.
Corynton Products Co., 1100 Adams St., Hoboken, N. J.
Cosom Corp., 6030 Wayzata Blvd., Minneapolis 16, Minn.
Cotswold Fibres, Inc., 916 Eighth Ave., Columbus, Ga.
•Cottonluxe Mfg. Co., 781 E. 136th St., New York 54, N. Y.
Cottrell Co., The, Mechanic St., Westerly, R. I.
Coughlin Mfg. Co., 697-699 E. 132nd St., New York 54, N. Y.

Count-O-Matic, Inc., Div., U. S. Engineering Co., 40-24—22nd St., Long Island City 1, N. Y.
Couper, Don, Lower Shad Road, Pound Ridge, N. Y.
Courtland Box Co., Inc., 596—15th Ave., Columbus, Ga.
Cowan, Elton T., Co., Inc., 133 W. 19th St., New York 11, N. Y.
Coy Disbrow Div., Pohlman Paper, Inc., 686 Greenwich St., New York 14, N. Y.
Cozier Container Corp., 446 E. 131st St., Cleveland 8, Ohio
Cozzoli Machine Co., 401 E. Third St., Plainfield, N. J.
Cozzone Marking Co., 18 Nuttman St., Newark 1, N. J.
Craftint Mfg. Co., The, 1615 Collamer Ave., Cleveland 10, Ohio
Craftsmen Machinery Co., 75 W. Dedham St., Boston 18, Mass.
Craig Systems, Inc., 90 Holten St., Danvers, Mass.
Crandall Can Filler Machine Co., 1392 Niagara St., Buffalo 13, N. Y.
Crandall, Inc., 104 N. Oak Park Ave., Oak Park, Ill.
Crandon Paper Mills, Inc., Foot of 18th St., Fort Madison, Iowa
Crane, Susan, Gift Packaging, 1525 Edison St., Dallas 7, Texas
Crane, William B., Co., 141 E. 44th St., New York, N. Y.
Crawford Engineering, Box 2216, Edgewood Station, Providence 5, R. I.
Crawford Industries, Inc., National Transit Bldg., Oil City, Pa.
•Crawford, John W., Co., 160 Varick St., New York 13, N. Y.
Creative Moulded Products Co., 620 Prospect Pl., Brooklyn 16, N. Y.
•Creative Packaging, Inc.
General Offices, 111 Monument Circle, Indianapolis, Ind.
•Diamond Plastics Industries, Div., 4411 Hollins Rd., N.E., Roanoke, Va.
•Paper Package Co., Div., 1036 N. Capitol Ave., Indianapolis 6, Ind.
Creative Plastic Containers, 5915 Blackwelder St., Culver City, Calif.
Creators Art Service, 1465 Broadway, New York 36, N. Y.
Crescent Box Corp., E St. & Erie Ave., Philadelphia 34, Pa.
Crescent Box & Printing Co., 410 Wilson Ave., Tullahoma, Tenn.
Crescent Ink & Color Co. of Pa., 464 N. Fifth St., Philadelphia 23, Pa.
Crescent Paper Tube Co., Inc., 120 E. Fourth St., Covington, Ky.
Crescent Truck Co., Div. Barret-Cravens Co., 606 Dundee Rd., Northbrook, Ill.
Crest Brands, Inc., 615 Winters Ave., Paramus, N. J.
Croce, Isabel M., 50 Park Ave., New York 16, N. Y.
Crocker, Burbank Papers, Inc., 545 Westminster St., Fitchburg, Mass.
Crocker, H. S., Co., Inc., 1000 San Mateo Ave., San Bruno, Calif.
•Crompton & Knowles Packaging Corp.
General Offices, Suffield St., Agawam, Mass.
•Redington Div., 3000 St. Charles Rd., Bellwood, Ill.
•Wrap-King Div., Suffield St., Agawam, Mass.
Crompton-Richmond Co., Inc., 1071 Ave. of The Americas, New York 18, N. Y.
•Cromwell Paper Co., The, 180 N. Wabash Ave., Chicago 1, Ill.
Cronk Box Corp., 401 Cleveland Ave., Highland Park, N. J.
Crook Paper Box Co., 110 E. Tenth Ave., No. Kansas City 16, Mo.
Crook, William A., Co., Inc., 47 Bacon St., Watertown 72, Mass.
Cross Paper Products Corp., 4377 Bronx Blvd., New York 66, N. Y.
•Crossett Paper Mills, Crossett, Ark.
Crowe Engineering Co., The, 4210 Dane Ave., Cincinnati 23, Ohio
Crowell Carton Div., St. Regis Paper Co., Marshall, Mich.
Crown Aerosol Products Co., 195-40 Jamaica Ave., Hollis 23, N. Y.
Crown Color & Design Corp., 1495 Herkimer St., Brooklyn 33, N. Y.
•Crown Cork & Seal Co., Inc., 9300 Ashton Road, Philadelphia 36, Pa.
Crown Engineering & Sales Co., 421 Hill St., Harrison, N. J.
Crown Glass Corp., 600 W. Hubbard St., Chicago 10, Ill.
Crown Machine & Tool Co., 2800 W. Lancaster St., Fort Worth, Texas
Crown Paper Board Co., Inc., Delaware Ave. & Tasker St., Philadelphia 48, Pa.
Crown Paper Box Corp., 2101 Montcalm St., Indianapolis 20, Ind.
Crown Wire Mfg. Co., Garden Pl., Edgewater, N. J.
Crown Zellerbach Corp.
General Offices, 1 Bush St., San Francisco, Calif.
Gaylord Container Div., 111 N. Fourth St., St. Louis 2, Mo.
Industrial Paper Sales Div., 1 Bush St., San Francisco, Calif.
Multiwall Bag Sales Div., 1 Bush St., San Francisco, Calif.
Western-Waxide Div., 2101 Williams St., San Leandro, Calif.
Cruver Mfg. Co., 2460 W. Jackson Blvd., Chicago 12, Ill.
Cruze, Charles, Inc., 2340 W. Third St., Los Angeles 57, Calif.
Cryovac Div., W. R. Grace & Co., 62 Whittemore Ave., Cambridge 40, Mass.
Crystal Paper Box Co., Inc., 153-9 W. 27th St., New York 1, N. Y.
Crystal Preforming & Packaging, Inc., Road 25 W., Warsaw, Ind.
•Crystal Tissue Co., The, Middletown, Ohio
Crystal Transparent Corp., 101 W. Forest Ave., Englewood, N. J.
Crystal Tube Corp., 6625 W. Diversey Ave., Chicago 35, Ill.
Crystal-X Corp., W. Lenni Road, Lenni Mills, Pa.
Culligan, Inc., 1657 Shermer Rd., Northbrook, Ill.
Cumberland Box Co., 215 W. Elder St., Cumberland, Md.
Cumberland Packing Co., 2 Cumberland St., Brooklyn 1, N. Y.
Cummins-Chicago Corp., 2042 N. Lincoln Pkwy., Chicago, Ill.
Cupples-Hesse Corp., 4175 Kingshighway N., St. Louis 15, Mo.
Curley Co., Inc., Jefferson & Master Sts., Camden, N. J.
Curtis, S., & Son, Inc., Sandy Hook, Conn.
Curtiss-Wright Corp., Electronics Div., Industrial Controls Dept., Garden St., Carlstadt, N. J.
Cushion Pack, Inc., 150 Fifth Ave., Hawthorne, N. J.
Cushman & Denison Mfg. Co., Inc., 730 Garden St., Carlstadt, N. J.
Custom Merchandise Corp., 43 York St., Brooklyn 1, N. Y.
Custom Packaging, Inc., 136 Tichenor St., Newark 5, N. J.
Custom-Made Paper Bag Co., 33-02 Skillman Ave., Long Island City, N. Y.
Custom-Pak, Inc., Morrison Pl., Cincinnati 43, Ohio
Cutler Bros. Box & Lumber Co., 711 W. Prospect Ave., Fairview, N. J.
Cutler-Hammer, Inc., 260 N. 12th St., Milwaukee 1, Wis.

D

•Dab-O-Matic Corp., 93 Riverdale Ave., Yonkers, N. Y.
Dacam Corp., 528 Turner Ave., Charlotte 1, N. C.
Dadmun, Royal, & Associates, Inc., 1118 N. Calvert St., Baltimore 2, Md.
Daher Co., Inc., 43-34—37th St., Long Island City 1, N. Y.
Dailey, Don, & Assoc., 123 Locust St., Evansville 8, Ind.
Dairy Industries Supply Assn., Inc., 1145—19th St., N.W., Washington 6, D. C.
Dairy Whipt Div., Aerated Container Corp., 39 S. LaSalle St., Chicago 3, Ill.
Dairypak Butler, Inc., 7920 Mapleway Dr., Olmstead Falls, Ohio
Dale, John, Ltd., Brunswick Park Rd., New Southgate, London, N. 11, England
Dallas Label & Box Co., 1504 Munger Ave., Dallas, Texas
Dalmas, Ltd., Junior St., Leicester, England
Dalsemer, Gordon H., 1532 Mathieson Bldg., Baltimore 2, Md.
Danbury Square Box Co., The, 10 Elmwood Place, Danbury, Conn.
Daniels Mfg. Co., 114 Kempt St., Rhinelander, Wis.
Danielson Manufacturing Co., Danielson, Conn.
Danish Packaging Institute, The, 42, Vimmelskaftet, Copenhagen K, Denmark
Dapol Plastics, Inc., 53 Northboro St., Worcester 4, Mass.
Darling & Co., 4201 S. Ashland Ave., Chicago 9, Ill.
Darr, Harold W., 5 E. 22nd St., Minneapolis 4, Minn.
Daubert Chemical Co., 4700 S. Central Ave., Chicago 38, Ill.
Davidson Corp., 29 Ryerson St., Brooklyn 5, N. Y.
Davidson, D. H., Mfg. Co., 2007-11 Washington Ave., Philadelphia 46, Pa.
Davidson Products Co., 1166 Mercer St., Seattle 9, Wash.
Davies Can Co., The, 8007 Grand Ave., Cleveland 4, Ohio
Davies, Helen, Co., 140 W. 57th St., New York 19, N. Y.
Davies, Henry K., & Co., Inc., 479 Broad St., Glen Rock, N. J.
Davis, John R., & Co., 3038 Surrey Lane, Chamblee, Ga.
•Davis, Joseph, Plastics Co., 450 Schuyler Ave., Kearny, N. J.
Davis Machine Corp., 310 Fairview Rd., Camden, Ark.
Davis, Orvil, One E. Putnam Ave., Greenwich, Conn.
Davis, S. H., Paper Box Co., The, 1028 W. Central Ave., Toledo 6, Ohio
Davison Chemical Div., W. R. Grace & Co., 101 N. Charles St., Baltimore 3, Md.
Dawson, F. C., Engineering Co., 85 Jackson St., Canton, Mass.
Day Mfg. Co., Inc., 219 S. Crockett St., Sherman, Texas
Dayco Corp., The, P. O. Box 1004, Dayton, Ohio
Dayton Embossed Products Corp., 400 Linden Ave., Dayton 3, Ohio
Dean, Charles C. S., 2201 Pennsylvania Ave., Philadelphia 30, Pa.
Dean Products, Inc., 1048 Dean St., Brooklyn 38, N. Y.
Dearborn Chemical Co., Merchandise Mart Plaza, Chicago 54, Ill.
DeBell & Richardson, Inc., Water St., Hazardville, Conn.
Decal Ad-Stik Co., 333 Sixth Ave., New York 14, N. Y.

Decofoam, P.O. Box 504, Sacramento 3, Calif.
Deerfield Glassine Co., Main St., Monroe Bridge, Mass.
Deerfield Plastics Co., Inc., 271 Main St., So. Deerfield, Mass.
Deitz Co., Inc., 9 E. Wesley St., So. Hackensack, N. J.
Dejonge, Louis, & Co., 233 Broadway, New York 7, N. Y.
Dekcraft Corp., The, 15 Burke Lane, Syosset, N. Y.
Del Val Ink & Color, Inc., Bethel & Camden Aves., Pennsauken, N. J.
Delamere & Williams Co., Ltd., 35 Carson St., Toronto 14, Ont., Canada
Delaware Barrel & Drum Co., Inc., P.O. Box 1648, Wilmington 99, Del.
Delaware Ribbon Mfrs., Inc., Seventh & Somerset St., Philadelphia 33, Pa.
Deline, I. A., Paper Boxes, Inc., 1055 S. Jason St., Denver 9, Colo.
Delkay Plastics Corp., 13441 S. Western Ave., Gardena, Calif.
Delmar Paper Box Co., The, 419 W. Fifth St., Cincinnati 2, Ohio
Delsen Corp., 719 W. Broadway, Glendale 4, Calif.
Delta Engineering Corp., 126 W. Emerson St., Melrose 76, Mass.
De Luxe Craft Mfg. Co., 1579 Milwaukee Ave., Chicago 22, Ill.
DeLuxe Packages, Inc., 4911 Mason St., South Gate, Calif.
De Mattia Machine & Tool Co., Brighton & Chelsea Roads, Clifton, N. J.
DeMert & Dougherty, Inc., 5000 W. 41st St., Chicago 50, Ill.
Demuth Glass Works, Inc., P.O. Box 629, Parkersburg, W. Va.
DeNina, James Andrew, Assoc., 516 Fifth Ave., New York 36, N. Y.
Denney-Reyburn Co., 30 W. Barnard St., West Chester, Pa.
Dennis Chemical Co., 2701 Papin St., St. Louis 3, Mo.
•Dennison Mfg. Co., 300 Howard St., Framingham, Mass.
Denver Plastics, Inc., 15200 W. Colfax, Golden, Colo.
Dependable Compressor & Machine Co., Inc., 157 W. 21st St., New York 11, N. Y.
Derby Sealers Div., Minnesota Mining & Mfg. Co., P. O. Box 550, Derby, Conn.
Design Directions, Inc., 307 Fifth Ave., New York 16, N. Y.
Design Dynamics, Inc., 456 W. Frontage Rd., Northfield, Ill.
Design Performance Laboratories, 575 Lexington Ave., New York 22, N. Y.
Design Planning Assoc., 1617 Pennsylvania Blvd., Philadelphia 3, Pa.
Design Research, Inc., 420 N. Michigan Ave., Chicago 11, Ill.
DesignComm, 6 W. Ontario St., Chicago 10, Ill.
Designers for Industry, Inc., 4241 Fulton Parkway, Cleveland 9, Ohio
Designers II, 8021 Forsyth Blvd., Clayton 5, Mo.
Deskey, Donald, Associates, Inc., 575 Madison Ave., New York 22, N. Y.
Desmet, George W., Corp., 185 Devonshire St., Boston 10, Mass.
De Soto Chemical Coatings, Inc., 1350 S. Kostner St., Chicago 23, Ill.
Detecto Scales, Inc., 540 Park Ave., Brooklyn 5, N. Y.
Detroit Sulphite Pulp & Paper Co., 9125 W. Jefferson Ave., Detroit 17, Mich.
Detroit Testing Laboratory, Inc., The, 554 Bagley Ave., Detroit 26, Mich.
Deutsch, B., Box & Lumber Co., 8-11 —44th Ave., Long Island City 1, N. Y.
DeVilbiss Co., The, 300 Phillips Ave., Toledo 1, Ohio
DeVilbiss Co., Metal Fabricating Div., 5741 Russell St., Detroit 11, Mich.
Devon Tape Corp., 110 Hartford Ave., Mt. Vernon, N. Y.
Dewey & Almy Chemical Div., W. R. Grace & Co., 62 Whittemore Ave., Cambridge 40, Mass.
DeWitt Plastics, Aurelius Ave., Auburn, N. Y.
Dexter, C. H., & Sons, Inc., 100 Canal St., Windsor Locks, Conn.
•Dexter Co., The, Div. Miehle-Goss-Dexter, Inc., 2011 Hastings St., Chicago 8, Ill.
Diagraph-Bradley Industries, Inc., P.O. Box 269, Herrin, Ill.
Diamond Alkali Co., 300 Union Commerce Bldg., Cleveland 14, Ohio
•Diamond Chain Co., Inc., 402 Kentucky Ave., Indianapolis 7, Ind.
Diamond Glass Co., First Ave., Royersford, Pa.
Diamond National Corp.
General Offices, 733 Third Ave., New York 17, N. Y.
•Gardner Div., The, 407 Charles St., Middletown, Ohio
Gardner-Brooks, Inc., Sub., 140 Wilbraham Ave., Springfield, Mass.
•United States Printing & Lithograph, Div., 733 Third Ave., New York 17, N. Y.
Diamond Paper Box Co., 1330 Unity St., Philadelphia 24, Pa.
•Diamond Plastics Industries, Div. Creative Packaging, Inc., 4411 Hollins Rd. N.E., Roanoke, Va.
Diamond Printing & Label Corp., 1045 Frankford Ave., Philadelphia 25, Pa.
Diamond Straw & Machine Co., 615 W. 131st St., New York 27, N. Y.
Diaphane Corp., 1934 Arch St., Philadelphia 3, Pa.
Dice, J. W., Co., 16 Highwood Ave., Englewood, N. J.
Dickens, Robert Sidney, Inc., 908 N. Ernst Court, Chicago 11, Ill.
Dickinson, C. W., & Assoc., 253 Atlanta Drive, Pittsburgh 28, Pa.
Dickinson, John, & Co. Ltd., Apsley Mills, Hemel Hempstead, Herts., England
•Diederichs & Griffin Co., 6215 W. Touhy Ave., Chicago 48, Ill.
Diematic Mfg. Corp., 30 E. Tenth St., New York 3, N. Y.
Dierckx, Jules, Distributors, Inc., 70 Duane St., New York 7, N. Y.
Dierks Paper Co., 810 Whittington Ave., Hot Springs, Ark.
Dieterle & Slaight Box Corp., 169 Murray St., Newark 5, N. J.
Dietz Machine Works, Inc., 20 W. Berkley St., Philadelphia 44, Pa.
Dikeman Laminating Corp., 181 Sargeant Ave., Clifton 1, N. J.
Dill Manufacturing Co., The, 700 E. 82nd St., Cleveland 3, Ohio
•Dillon-Beck Mfg. Co., 1227 Central Ave., Hillside, N. J.
•Dilts Div., The Black-Clawson Co., 46 N. First St., Fulton, N. Y.
Disbrow Mfg. Co., 181 S. 18th St., East Orange, N. J.
Dispens-A-Label Devices, 201 Boggs Ave., Pittsburgh 11, Pa.
Display Finishing Co., Inc., 21-30—44th Road, Long Island City 1, N. Y.
Display Guild, 85-09—57th Ave., Elmhurst, N. Y.
Displayers, Inc., The, 635 W. 54th St., New York 19, N. Y.
Diverse Products, 111 E. 21st St., Brooklyn 26, N. Y.
Dix, J. J., Inc., 601 W. 26th St., New York 1, N. Y.
Dixie Container Corp., 2000 Jefferson Davis Highway, Richmond 3, Va.
Dixie Cup Div., American Can Co., 24th & Dixie Ave., Easton, Pa.
Dixie Wax Paper Co., 1300 S. Polk St., Dallas 22, Texas
Dixon & Parcels Associates, Inc., 485 Fifth Ave., New York 17, N. Y.
DoAll Co., The, 254 N. Laurel Ave., Des Plaines, Ill.
•Dobeckmun Co., The, Div. The Dow Chemical Co., P. O. Box 6417, Cleveland 1, Ohio
Dolson, C. E., 1003 Corondelet Bldg., New Orleans 12, La.
Dodge Cork Co., Inc., Laurel & Manor Sts., Lancaster, Pa.
Dodge, E. F., Paper Box Corp., 142 Water St., Leominster, Mass.
Dodge Fibers Corp., John St., Hoosick Falls, N. Y.
Dodge Mfg. Corp., S. Union St., Mishawaka, Ind.
Dominion Envelope Co., Ltd., 39 Greenbelt Dr., Don Mills, Ont., Canada
Dominion Glass Co., Ltd., 1111 Beaver Hall Hill, Montreal 1, Que., Canada
Donald Art Co., Inc., 125 Spencer Place, Mamaroneck, N. Y.
Donnelley, R. R., & Sons Co., 350 E. 22nd St., Chicago 16, Ill.
Donoher, Dan, & Co., 15 W. 44th St., New York 36, N. Y.
Donrico, Inc., 438 W. 37th St., New York 18, N. Y.
Doran Brothers, Inc., 30 Shelter Rock Road, Danbury, Conn.
Dorey Corrugated Paper Products, Inc., 37 Main St., Scottsville, N. Y.
Dorfman, A., Co., Inc., 57-59 W. 19th St., New York 11, N. Y.
Dorsey Display Corp., 480 Lexington Ave., New York 17, N. Y.
•Dosamatic Dropper Corp., 111 W. Sunrise Hwy., Freeport, N. Y.
•Doughboy Industries, Inc., 215 N. Main Ave., New Richmond, Wis.
•Dougherty Brothers, Tuckahoe Road & Pine Ave., Buena, N. J.
Douglas, Charles E., & Co., Ltd., 86 Strand, London, W. C. 2, England
Douglas Chemical Co., 620 E. 16th Ave., No. Kansas City 16, Mo.
Dove, J. B., & Sons, Inc., Beaver & Canal Sts., Bristol, Pa.
Doven Machine & Engineering, Inc., 2706 W. Van Buren St., Chicago 12, Ill.
Dover Molded Products Co., The, 1000 East Ave., Dover, Ohio
•Dow Chemical Co., The, Midland, Mich.
Dow Corning Corp., Midland, Mich.
Downing Box Co., 3832 N. Third St., Milwaukee 12, Wis.
•Downingtown Paper Co., Packaging Div., Boot Road & Chestnut St., Downingtown, Pa.
Doyle, J. E., Co., The, 1220 W. Sixth St., Cleveland 13, Ohio
Dralle, Elizabeth M., 20 W. Eighth St., New York 11, N. Y.
Draper & Emerick, 164 Ridgewood Road, Pittsburgh 9, Pa.
Dravo Corp., Neville Island, Pittsburgh 25, Pa.
Dresden, Mark K., Providence Road, Media, Pa.
Dreyer, H. D., Box Co., Inc., Aliceanna & Spring Sts., Baltimore 5, Md.
Dreyfus, L. A., Co., P.O. Box 500, So. Plainfield, N. J.
Dreyfuss, Henry, 4 W. 58th St., New York, N. Y.
DriAire, Inc., 26 Fitch St., E. Norwalk, Conn.
Dripcut Starline Corp., P. O. Box 3131, Santa Barbara, Calif.
Driver, Geo., & Son, Ltd., Abbeydale Road, Wembley, Middlesex, England
Drug Package, Inc., 2419 Glasgow Ave., St. Louis 6, Mo.
Drum Equipment Corp., Green Lane, Union, N. J.

Drum Parts, Inc., 10311 Meech Ave., Cleveland 5, Ohio
Dryomatic Corp., 715 N. Fayette St., Alexandria, Va.
Dubelier Elastic Fabricators, 129 W. 29th St., New York 1, N. Y.
DuBois Plastic Products, Inc., 170 Florida St., Buffalo 8, N. Y.
Dubuque Container Div., St. Regis Paper Co., Brunswick Block, Dubuque, Iowa
Dudley Machinery Corp., Ryan Field Bldg. #5, Hemet, Calif.
Duell, A. C., & Sons, R.F.D. 1, Oswego, N. Y.
Dumatic Industries, Inc., 112 N. 12th St., Philadelphia 7, Pa.
•Dumont, Inc., 112 S. Dean St., Englewood, N. J.
Dunbar, E. Helen, 530 E. 88th St., New York, N. Y.
Duncan Equipment Co., 506 Broadway, Seattle 22, Wash.
Dunn, Thomas W., Co., Inc., 9 Victoria Terrace, Ridgefield, N. J.
Dunning, J. H., Corp., 1950 Post Road, Darien, Conn.
Duo-Pak Containers, 141 Bulkley Ave., Sausalito, Calif.
•du Pont de Nemours, E. I., & Co., Inc., Wilmington 98, Del.
Dura Bac, Inc., 808 Broadway, New York 3, N. Y.
Dura-Lee Corp., 1102 S. Mill St., Kansas City 5, Kan.
Durant Mfg. Co., 1900 N. Buffum St., Milwaukee 1, Wis.
Dura-Pak Corp., Dwight Bldg., Kansas City 5, Mo.
Durapak Mfg. Co., 150 W. Ostend St., Baltimore 30, Md.
Durez Plastics Div., Hooker Chemical Corp., 277 Walck Road, No. Tonawanda, N. Y.
•Dusenbery, John, Co., Inc., 395 Allwood Road, Clifton, N. J.
Dusseau, Lambert, 70 E. 79th St., New York 21, N. Y.
Duval Industries, Inc., 120 Banks St., Winthrop 52, Mass.
•Dyes Dept., American Cyanamid Co., Bound Brook, N. J.
Dygert & Stone, Inc., 56 Industrial St., Rochester 17, N. Y.
Dyment Co., Inc., The, 1163 E. 40th St., Cleveland 14, Ohio
Dymo Industries, Inc., Berkeley 10, Calif.
•Dyn Corp., 285 Palisade Ave., Cliffside Park, N. J.
•Dyna-Foam Div., Sun Chemical Corp., Ellenville, N. Y.
Dynatech Process, Inc., Hackensack, N.J.

E

E-Z Packaging Corp., 5111 N. Sheridan Road, Chicago 40, Ill.
Eagle Machinery Co., Ltd., 465 California St., San Francisco 4, Calif.
Eagle Paper Box Mfg. Co., Inc., 3021 W. Carroll Ave., Chicago 12, Ill.
Earlville Paper Box Co., Inc., Clyde St., Earlville, N. Y.
East Chicago Machine Tool Corp., 4801 Railroad Ave., East Chicago, Ind.
East Texas Pulp & Paper Co., P. O. Box 816, Silsbee, Texas
Eastern Can Co., Inc., 649 Kent Ave., Brooklyn 11, N. Y.
Eastern Cellophane Co., Inc., 109-11 Purchase St., Boston 10, Mass.
Eastern Colortype Corp., Brighton Road, Clifton, N. J.
Eastern Corrugated Container Corp., 227 Clifton Blvd., Clifton, N. J.
Eastern Display & Carton Corp., 447 Hickory St., Kearny, N. J.
Eastern Duo Fast Corp., 176 Ave. of The Americas, New York 13, N. Y.
Eastern Seaboard Plastics, Inc., 217 Astor St., Newark 5, N. J.
Eastern Steel Barrel Corp., 302 Lincoln Blvd., Bound Brook, N. J.
Eastern Vacuum Forming Co., 611 Heck St., Asbury Park, N. J.
Eastern Wooden Box Assn., 402 Barr Bldg., Washington 6, D. C.
•Eastman Chemical Products, Inc., Kingsport, Tenn.
•Eastman Kodak Co., 343 State St., Rochester 4, N. Y.
Eastman Tag & Label Co., 3451 Collins Ave., Richmond 4, Calif.
Easy Fold Corp., 860 N. Union St., Stockton, Calif.
Easy-Mark, Inc., 39 Crosby St., Lowell, Mass.
Ebert Electronics Corp., 212-26 Jamaica Ave., Queens Village 28, N. Y.
Eckstein-Stone, Inc., 24 W. 45th St., New York 36, N. Y.
Eclipse Plastic Industries, Inc., P.O. Box 430, Sarasota, Fla.
Econo Products, Inc., 132 Humboldt St., Rochester 10, N. Y.
•Economic Machinery Co., 60 Fremont St., Worcester 3, Mass.
Economy Cover Corp., 369 DeKalb Ave., Brooklyn, N. Y.
Economy Engineering Co., 4511 W. Lake St., Chicago 24, Ill.
Econ-O-Veyor Corp., 224 Glen Cove Ave., Glen Cove, N. Y.
Edinger-Wyckoff, Inc., 1410 Spruce St., Stroudsburg, Pa.
Edison Folding Cartons, Div., Gaul & Ingalls, Inc., 1850 S. Pulaski Road, Chicago 23, Ill.
Edlaw Packaging Co., Inc., The, 88-61—76th Ave., Glendale 27, N. Y.
Edwards & Deutsch Lithographing Co., 2320 Wabash Ave., Chicago 16, Ill.
Edwards Folding Box Co., 1136 N. American St., Philadelphia 23, Pa.
Egan, Frank W., & Co., 36 S. Adamsville Road, Somerville, N. J.
Egyptian Lacquer Mfg. Co., The, P. O. Box 444, Newark 1, N. J.
Ehrman & Reiner, Inc., 9 E. 45th St., New York 17, N. Y.
Einson-Freeman Co., Inc., Starr & Borden Aves., Long Island City 1, N. Y.
Eisler Engineering Co., Inc., 750 S. 13th St., Newark 3, N. J.
•Ekco-Alcoa Containers, Inc., Wheeling & Hintz Roads, Wheeling, Ill.
Elberta Crate & Box Co., Lake Bradford Road, Tallahassee, Fla.
Eldon Manufacturing Co., 1010 E. 62nd St., Los Angeles 1, Calif.
Electric Autolite Co., The, Toledo 1, Ohio
Electric City Box Co., 795 Woodlawn Ave., Buffalo 11, N. Y.
Electric Eye Equipment Co., 1938 E. Fairchild St., Danville, Ill.
Electric Hotpack Co., Inc., The, Cottman Ave. & Melrose St., Philadelphia 35, Pa.
Electronic Machine Parts, Inc., 128-11—18th Ave., College Point 56, N. Y.
Electronic Processes Corp., 436 Bryant St., San Francisco 7, Calif.
Electronic Products Corp., 207 S. Green St., Chicago 7, Ill.
Electronic Wave Products, Inc., 15 E. 22nd St., New York 10, N. Y.
Electronics Corp. of America, Photoswitch Div., 1 Memorial Dr., Cambridge 42, Mass.
Electro Technical Products, Div. Sun Chemical Corp., 113 E. Centre St., Nutley 10, N. J.
Elgin Co., 456 Park Ave. S., New York 16, N. Y.
Elgin Manufacturing Co., 200 Brook St., Elgin, Ill.
Elizabeth Carbide Die Co., 5423 Smithfield St., McKeesport, Pa.
Elizabeth Iron Works, Inc., Green Lane, Union, N. J.
Ellen Products Co., Maple Ave., Haverstraw, N. Y.
Ellies, Dave, Industrial Design, Inc., 799 W. Goodale Blvd., Columbus 12, Ohio
Elliott Manufacturing Co., Inc., 1735 Ventura St., Fresno 1, Calif.
Ellis, C. H., Co., Inc., 134-140 S. Pennsylvania St., Indianapolis 4, Ind.
Ellis Paperboard Products, Inc., Thompson's Point, Portland, Maine
Ellisco, Inc., 4032 N. American St., Philadelphia 40, Pa.
Elm Coated Fabrics Co., Inc., 261 Fifth Ave., New York 16, N. Y.
Elm Press Co., Inc., The, 150 W. 22nd St., New York 11, N. Y.
El-Tronics, Inc., 1360 Suburban Station Bldg., Philadelphia 3, Pa.
Elwell-Parker Electric Co., The, 4205 St. Clair Ave., Cleveland 3, Ohio
Embassy Laboratories, Inc., 2896-98 Fulton St., Brooklyn 7, N. Y.
Embossograph Process Co., Inc., 3720—14th Ave., Brooklyn 18, N. Y.
Embry Container Corp., 646 W. Hill St., Louisville 8, Ky.
Emeloid Co., Inc., The, Sub. Addressograph-Multigraph Corp., 1239 Central Ave., Hillside 5, N. J.
Emerick, J. L., Co., 1559-61 Kuhlview Dr., Pittsburgh 37, Pa.
Emerson Labeltape & Supply Corp., 100 Emerson Pl., Brooklyn 5, N. Y.
Emerson Plastics Corp., 1383 Seabury Ave., Bronx 61, N. Y.
•Emhart Mfg. Co., Portland Div., Main St., Portland, Conn.
Emmer Glass Corp., 6250 N.W. 35th Ave., Miami 47, Fla.
Empire Box Corp., 17 E. Chestnut St., Chicago 11, Ill.
Empire Can Corp., 220 Ashford St., Brooklyn 7, N. Y.
Empire Specialties, Inc., 123 Schermerhorn St., Brooklyn 1, N. Y.
Emson Research, Inc., 118 Burr Court, Bridgeport 5, Conn.
Enameloid Sign & Display Co., Inc., 140 Peach St., Reading, Pa.
Encapsulations, Inc., 288 Chestnut St., Newark 5, N. J.
Encore Studio, 410 W. 47th St., New York 33, N. Y.
Engelhard Industries, Inc., 113 Astor St., Newark 2, N. J.
Engelman, H. C., Co., 27050 Gratiot Ave., Roseville, Mich.
Engine Parts Mfg. Co., The, Ronor Div., 1360 W. Ninth St., Cleveland 13, Ohio
Engineered Handling Systems Div., Wiretyer Corp., 65 Leliarts Lane, E. Paterson, N. J.
•Enjay Chemical Co., Div. Humble Oil & Refining Co., 15 W. 51st St., New York 19, N. Y.
Enterprise Paper Co., 435 N. Fifth St., Philadelphia 23, Pa.
Enu-matic Equipment Corp., P.O. Box 1146, Burbank, Calif.
Envelope Manufacturers Assn. of America, 521 Fifth Ave., New York 17, N.Y.
Eppler, John, Co., The, 1210 S. Sharp St., Baltimore 30, Md.
Epsen Lithographing Co., 2000 California St., Omaha 2, Neb.
Epstein Cooperage, 359 Frost St., Brooklyn, N. Y.
Equality Plastics, Inc., 138 W. 25th St., New York 16, N. Y.
Equipment Manufacturing, Inc., 21550 Hoover Road, Detroit 5, Mich.
Equitable Paper Bag Co., Inc., 45-50 Van Dam St., Long Island City 1, N. Y.
Era Research, Inc., 1009 Montana Ave., Santa Monica, Calif.

•Erdco Engineering Corp., 136 Official Road, Addison, Ill.
Erie Resistor Corp., 644 W. 12th St., Erie, Pa.
Eriez Manufacturing Co., 310 Magnet Drive, Erie, Pa.
Ernest Paper Products, Inc., 2424 E. 26th St., Los Angeles 58, Calif.
•Erno Products Co., 65 N. Second St., Philadelphia 6, Pa.
Eron & Eron, Inc., 36 Grand Ave., Englewood, N. J.
Eronel Services, Inc., 4 Lanesville Road, New Milford, Conn.
•Errich International Corp., 35 W. 36th St., New York 18, N. Y.
•Ertel Engineering Corp., 8-14 N. Front St., Kingston 14, N. Y.
Erving Paper Mills, Erving, Mass.
Escambia Chemical Corp., 261 Madison Ave., New York 16, N. Y.
Essex Conveyors, Inc., 101 Colden St., Newark 3, N. J.
Essex Paper Box Mfg. Co., Inc., 281-297 Astor St., Newark 5, N. J.
Esterline-Angus Co., The, 1201 Main St., Speedway, Ind.
Estes, E. B., & Sons, 100 Fifth Ave., New York 11, N. Y.
Eureka Manufacturing Co., Inc., 144 W. Britannia St., Taunton, Mass.
Eureka Paper Box Co., 401 E. Canal St., Williamsport, Pa.
Eureka Paper Box Co., Inc., 1940 Tarleton St., Los Angeles 11, Calif.
Eureka Specialty Printing Co., 530 Electric St., Scranton 9, Pa.
Evans Chemetics, Inc., 250 E. 43rd St., New York 17, N. Y.
Evans Crowder Co., 390 S. Lafayette St., So. Lyon, Mich.
Ever Ready Label Corp., 357 Cortlandt St., Belleville 9, N. J.
Eveready Pressurized Products, Inc., 1101 Beltline St., Cleveland 9, Ohio
Everett Transparent Container Co., 251 Third Ave., New York 10, N. Y.
Exact Weight Scale Co., The, 926 W. Fifth Ave., Columbus 15, Ohio
Exactron, Inc., Prospect & W. Madison Aves., Dumont, N. J.
Excel Automatic Products, Inc., 59–12th Ave., Newark 8, N. J.
Ex-Cell-O Corp., Ex-Cell-O-Staude Dept., 1200 Oakman Blvd., Detroit 32, Mich.
Excello Paper Products, 3351 Madison Road, Oakley, Cincinnati 9, Ohio
Excelsior Paper Specialties Co., 2001 Tonnelle Ave., No. Bergen, N. J.
Excelsior Plimptruck Co., Inc., Cardinal Place, Stamford, Conn.
Excelsior Transparent Bag Mfg. Co., 945 Nepperhan Ave., Yonkers, N. Y.
Excelsior Window Trimming Corp., 5 Union Sq., New York 3, N. Y.
Exeter Paper Co., Inc., 730 N. Franklin St., Chicago 10, Ill.
Expandex Corp., Wauregan, Conn.
Export Corp., 13310 Foley, Detroit 27, Mich.
Export-Import Corp., P.O. Box 1446, Jacksonville 1, Fla.
Express Container Corp., 105 Ave. L, Newark 5, N. J.
•Extruded Plastics, Inc., New Canaan Ave., Norwalk, Conn.
Extrudo Film Corp., 1841 Broadway, New York 23, N. Y.
Eyelet Specialty Div., The International Silver Co., P.O. Box 179, Wallingford, Conn.
Eyrle Co., 1539 Folsom St., San Francisco 3, Calif.

F

FMC Corp.
•Canning Machinery Div., 333 W. Julian St., San Jose 10, Calif.
•Hudson-Sharp Plant, 1207 Main St., Green Bay, Wis.
Packing Equipment Div., 3075–14th St., Riverside, Calif.
•Simplex Plant, P. O. Box 7095, Fruitvale Sta., Oakland, Calif.
•Stokes & Smith Plant, 4942 Summerdale Ave., Philadelphia 24, Pa.
Fabricon Products, 1721 Pleasant Ave., River Rouge, Mich.
Fabri-Kal Corp., 3303 E. Cork St., Kalamazoo, Mich.
Fab-Weld Corp., P.O. Box 1447, Simpson, Pa.
Facile Corp., Sub. Sun Chemical Corp., 185 Sixth Ave., Paterson 4, N. J.
Factory Service Co., 4615 N. 21st St., Milwaukee 9, Wis.
Fairbairn Co., The, 1900 Carroll Ave., San Francisco 24, Calif.
Fairbanks Co., The, 393 Lafayette St., New York 3, N. Y.
Fairchild's, Inc., 4864 Eagle Rock Blvd., Los Angeles 41, Calif.
Fairfield Barrel Co., Inc., 4000 Commerce Ave., Fairfield, Ala.
Fairfield Engineering Co., 324 Barnhart St., Marion, Ohio
Fairmont Glass Works, Inc., 1301 S. Keystone Ave., Indianapolis 7, Ind.
Fales, L. F., Machine Co., 1034 East St. Walpole, Mass.
Falge Engineering Div., Pen-Mac-Nye Co., 1056 Home Ave., Akron, Ohio
Faran Co., The, 261 Broadway, New York 7, N. Y.
Farber, Hy, & Associates, 8948 Wonderland Park, Los Angeles, Calif.
Farquhar, A. B., Div., The Oliver Corp., 142 N. Duke St., York, Pa.
Farrel-Birmingham Co., Inc., Watson-Stillman Press Div., 565 Blossom Rd., Rochester 10, N. Y.
Farrell, Harry H., 9757 Longwood Dr., Chicago 43, Ill.
Farrington Packaging Corp., Industrial Center, Needham Heights 94, Mass.
Farrington Texol Corp., 2000 Main St., Walpole, Mass.
Fasson Products, Div. Avery Adhesive Products, Inc., 250 Chester St., Painesville, Ohio
Fastener Corp., 3702 River Road, Franklin Park, Ill.
Fastex, Inc., P.O. Box 1759, Cleveland 5, Ohio
Faustel, Inc., 12801 W. Silver Spring Dr., Butler, Wis.
Favorite Plastic Corp., 186 Seventh St., Brooklyn 15, N. Y.
Feather-Mark Products Co., 173 Water St., New York 38, N. Y.
Feaver, John H., Paper Co., 1150 E. Mermaid Lane, Philadelphia 18, Pa.
Fedco Corp., 3600 W. Pratt Blvd., Chicago 45, Ill.
Feder Industries, Inc., 514 W. 57th St., New York 19, N. Y.
Federal Adhesives Corp., 630 W. 51st St., New York 19, N. Y.
Federal Carton Corp., 2001 Tonnelle Ave., No. Bergen, N. J.
Federal Container Corp., 4390 Olson Hwy., Minneapolis 22, Minn.
Federal Packaging Corp., 12100 S. Peoria St., Chicago 43, Ill.
Federal Paper Board Co., Inc.
General Offices, 24 River Road, Bogota, N. J.
Carton Div., 24 River Road, Bogota, N. J.
Container Div., 521 Marion Road, Columbus 7, Ohio
Federal Paper Board Co., Inc.
Glass Div., 515 E. Innis Ave., Columbus 7, Ohio
Paperboard Div., 24 River Road, Bogota, N. J.
Sweeney Lithograph Co., Inc., Sub., 69 Academy St., Belleville 9, N. J.
Federal Tin Co., Inc., Charles & Barre Sts., Baltimore 2, Md.
Federico, Joseph B., 1600 East Ave., Rochester 10, N. Y.
Feldman Glass Co., The, 261 Wolcott St., New Haven 13, Conn.
Felins Tying Machine Co., 3351 N. 35th St., Milwaukee 16, Wis.
Fellows Gear Shaper Co., The, 78 River St., Springfield, Vt.
Fenco Mfg. Co., 2700 Mogadore Rd., Akron, Ohio
Fenster, I., & Sons, Inc., 50 Washington St., Brooklyn 1, N. Y.
Fenton Label Co., Coral & Buckius Sts., Philadelphia 24, Pa.
Fenwal, Inc., Pleasant St., Ashland, Mass.
Ferguson, Harry J., Co., 167 West Ave., Jenkintown, Pa.
Ferguson-Lander Box Co., 740 Prairie St., Aurora, Ill.
Ferguson Machine Corp., 7818 Maplewood Industrial Ct., St. Louis 17, Mo.
Ferguson, Martin J., & Associates, 22 Purchase St., Rye, N. Y.
Ferrill, Harve, & Co., 11 E. Walton Place, Chicago 11, Ill.
Ferriot Bros., Inc., 2685 Mogadore Rd., Akron 5, Ohio
Ferris, Frank R., Co., 4026 N. Figueroa St., Los Angeles 65, Calif.
Ferro Corp., Fiber Glass Div., 200 Woodycrest Ave., Nashville, Tenn.
Ferster, Reinhold C., 110 Pearl St., Buffalo 2, N. Y.
Fessenden Companies, Inc., Railroad Sq., Townsend, Mass.
Fetter Steel Barrel Corp., 900 Hertel Ave., Buffalo 16, N. Y.
Fiberlay Corp., Box 909, Taunton, Mass.
Fibre Box Assn., 224 S. Michigan Ave., Chicago 4, Ill.
Fibre Drum Co., 20 N. Wacker Drive, Chicago 6, Ill.
•Fibreboard Paper Products Corp., 475 Brannan St., San Francisco 19, Calif.
Fichte Pallet Co., Inc., P.O. Box 278, Floral Park, N. Y.
Field Container Corp., 1700 Nicholas Blvd., Elk Grove Village, Ill.
Field, H., & Sons, 2339 S. LaSalle St., Chicago 16, Ill.
Fife Manufacturing Co., Inc., P. O. Box 9815, Oklahoma City 18, Okla.
Filler Machine Co., Inc., The, 10 Penn Ave., Rockledge, Philadelphia 11, Pa.
Film Font, The, 445 W. 23rd St., New York 11, N. Y.
Filmotype Corp., 7500 McCormick Blvd., Skokie, Ill.
Fil-O-Matic Corp., 59 E. Van Buren St., Chicago 5, Ill.
Filpaco Industries, Inc., 2453 S. Michigan Ave., Chicago 16, Ill.
Filtrol Corp., 3250 E. Washington Blvd. Los Angeles 23, Calif.
Findley, F. G., Co., The, 3033 W. Pemberton Ave., Milwaukee 45, Wis.
Fink, Karl, & Associates, 515 Madison Ave., New York 22, N. Y.
Finneran, Joseph R., Co., Currie & Paterson Aves., Wallington, N. J.
Firestone Plastics Co., Div. Firestone Tire & Rubber Co., Firestone Blvd., Pottstown, Pa.
Firestone Rubber & Latex Products Co., Firestone Blvd., Fall River, Mass.
Firestone Synthetic & Latex Products Co., 1200 Firestone Pkwy., Akron 1, Ohio
Fischbein, Dave, Co., 2720–30th Ave. S., Minneapolis 6, Minn.

Fischer & Porter Co., 660 Jacksonville Road, Warminster, Pa.
Fischer-Wehmann Corp., 314 Second St., Hackensack, N. J.
Fisher's Foils Ltd., Exhibition Grounds, Wembley, Middlesex, England
Fisler, Royal E., Co., 1315 Cheshire Lane, St. Louis 19, Mo.
Fitchburg Paper Co., 642 River St., Fitchburg, Mass.
Fitler, Edwin H., Co., The, Devereaux & Milnor Sts., Philadelphia 24, Pa.
Fitzhugh, William W., Inc., 200 Fifth Ave., New York 10, N. Y.
Flakewood, Inc., P. O. Box 2617, Portland 3, Ore.
Flambeau Plastics Corp., 61 Sawey Ave., Baraboo, Wis.
Flash Manufacturing Co., 169 Murray St., Newark 5, N. J.
Flashfold Box Corp., 211 E. Wallace St., Fort Wayne 5, Ind.
Flash-O-Graph Corp., 20-42 Steinway Ave., Long Island City 5, N. Y.
Fleetwood Paper Co., 836 S. Federal St., Chicago 5, Ill.
Fleischer Paper Co., 4171 Redwood Ave., Los Angeles 66, Calif.
Fleishhacker Paper Box Co., 2701 Merced St., San Leandro, Calif.
Fleisig, A., Sons Folding & Setup Paper Box Co., 472 Broadway, New York, N. Y.
Fleming-Potter Co., Inc., 1028 S. W. Adams St., Peoria 2, Ill.
Fleming & Sons, Inc., Magnolia Carton Div., 6935 Clinton Dr., Houston 1, Texas
•Flex Products Corp., 231 Meadow Road, Rutherford, N. J.
Flexcraft Industries, 527 Ave. P, Newark 5, N. J.
•Flexible Packaging Div., Continental Can Co., Inc., Mt. Vernon, Ohio
•Flexible Packaging Div., Standard Packaging Corp., 1 Lisbon St., Clifton, N.J.
Flexible Packing, Inc., 2 Neil Court, Oceanside, N. Y.
Flexible Plastic Bag, Inc., 2444 W. Washington Blvd., Los Angeles 18, Calif.
Flexible Tape & Label Co., 3262 Guernsey Ave., Memphis 12, Tenn.
Flexicraft Industries, Inc., 3670 Dyre Ave., New York 66, N. Y.
Flexigrip, Inc., 504 E. 74th St., New York 21, N. Y.
Flexo Transparent, Inc., 28-52 Wasson St., Buffalo 10, N. Y.
•Flex-O-Glass, Inc., 1100 N. Cicero Ave., Chicago 51, Ill.
Flexographic Technical Assn., 220 W. 42nd St., New York 36, N. Y.
Flexogravure Machine Co., 60 E. 42nd St., New York, N. Y.
Flex-O-Lators, Inc., 131 Locust St., Carthage, Mo.
Flex-O-Plate, Inc., 1323 S. Michigan, Chicago, Ill.
Flexoveyor Manufacturing Co., 1220 S. Acoma St., Denver 23, Colo.
Flint Ink Corp., 2546 Clark Ave., Detroit 9, Mich.
Flintkote Co., The, 5500 S. Alameda St., Los Angeles 54, Calif.
Flock Process Co., Inc., 375 Main Ave., Norwalk, Conn.
Flood & Conklin Mfg. Co., 132 Chestnut St., Newark, N. J.
Floquil Products, Inc., Cobleskill, N. Y.
Florian, Gordon, 97 Argonne St., Bridgeport 4, Conn.
Florida All-Bound Box Co., P.O. Box 848, Auburndale, Fla.
Florsheim Mfg. Co., Inc., 22 W. Monroe St., Chicago 3, Ill.
Flotepak Corp., 27380 W. Nine Mile Rd., Southfield, Mich.
Flour City Box Mfg. Co., Inc., 540 Ansborough Ave., Waterloo, Iowa
Flower City Specialty Co., 158 Hollenbeck St., Rochester 1, N. Y.
•Fluid Chemical Co., Inc., 878 Mt. Prospect Ave., Newark 4, N. J.
Fluted Paper Products Co., Inc., 29 Haviland St., So. Norwalk, Conn.
Flyndustries, Inc., 141 E. 44th St., New York 17, N. Y.
Foam Fabricators, Inc., 316 S. 16th St., St. Louis 3, Mo.
Foam Plastics, Inc., 125 S. Main St., Cambridge Springs, Pa.
Foampak Corp., 400 N. 12th St., Philadelphia 23, Pa.
Fogel, Samuel, Associates, 2310 Holt St., Montreal, Que., Canada
Fogg, Ezra D., Co., Inc., The, 1632 Whitney Ave., Hamden 17, Conn.
Foilcraft Printing Corp., 124 E. 40th St., New York 17, N. Y.
•Foils Packaging Corp., 602 Terrace Hilton Bldg., Cincinnati 2, Ohio
•Folding Carton & Drum Div., Continental Can Co., Inc., 633 Third Ave., New York 17, N. Y.
Folding Paper Box Assn. of America, 222 W. Adams St., Chicago 6, Ill.; 521 Fifth Ave., New York 17, N. Y.
Follansbee Steel Corp., P.O. Box 567, Follansbee, W. Va.
•Fonda Container Div., Standard Packaging Corp., St. Albans, Vt.
Food & Drug Research Laboratories, Inc., Maurice Ave. at 58th St., Maspeth 78, N. Y.
Food Equipment & Supply, Inc., 210 Mississippi St., San Francisco 7, Calif.
Food Film, Inc., Change Bridge Rd., Pine Brook, N. J.
Food Packaging Council, 520 N. Michigan Ave., Chicago 11, Ill.
Food Tray Assn., 342 Madison Ave., New York 17, N. Y.
Foote & Van Wie Co., 119 N. Peoria St., Chicago 7, Ill.
Forbes Brothers Co., 810 Santa Fe Ave., Los Angeles 21, Calif.
Forbes Lithograph Mfg. Co., P.O. Box 513, Boston 2, Mass.
Forbes Products Corp., 625 S. Goodman St., Rochester 20, N. Y.
Force Western, Inc., 434 S. Wabash St., Chicago 5, Ill.
Force, Wm. A., & Co., Inc., 216 Nichols Ave., Brooklyn 8, N. Y.
Fords (Finsbury) Ltd., Chantry Ave., Kempston, Bedford, England
•Formatron, Inc., 3717 Filbert St., Philadelphia 4, Pa.
Formed Container Corp., Sub. Phillips Petroleum Co., Orangeburg, N. Y.
Formold Plastics, Inc., Box 103, Blue Island, Ill.
Formpac, 2981 E. Broadway, Vancouver 12, B. C., Canada
Form-Pak of California, 4447 Alger St., Los Angeles 39, Calif.
Formvac, Dreikoenigstrasse 21, Zurich, Switzerland
Forsberg Paper Box Co., 2107 Fordem Ave., Madison 1, Wis.
Forsman, C. H., Co., 20-01 Pollitt Drive, Fairlawn, N. J.
Fort Dearborn Lithograph Co., 6035 W. Grosse Point Road, Chicago 31, Ill.
Fort Orange Paper Co., Sub. KVP Sutherland Paper Co., Castleton-on-Hudson, N. Y.
Fort Wayne Corrugated Paper Co., 130 E. Douglas Ave., Fort Wayne 1, Ind.
Fortifiber Corp., 4489 Bandini Blvd., Los Angeles 22, Calif.
Foster, Alan, Associates, 75 W. 45th St., New York, N. Y.
Foster-Forbes Glass Co., E. Charles St., Marion, Ind.
Foster Grant Co., Inc., 289 N. Main St., Leominster, Mass.
Foster, Robert, 14 Sutton Place S., New York 22, N. Y.
Fostoria Pressed Steel Corp., 1200 N. Main St., Fostoria, Ohio
Fountain Die Cutting Corp., 34 Hubert St., New York 13, N. Y.
Fox, C. J., Co., The, 236 Aborn St., Providence 4, R. I.
Fox, John P., Co., Inc., 1107 S. Mountain St., Monrovia, Calif.
Fox Valley Box Co., Inc., P.O. Box 150, St. Charles, Ill.
Fox Valley Plastics Corp., 146 W. Home Ave., Villa Park, Ill.
Foxon Co., The, 235 W. Park St., Providence 1, R. I.
Frabill Mfg. Co., 234 W. Florida St., Milwaukee 4, Wis.
France Engineering Co., The, 13000 Athens Ave., Cleveland 11, Ohio
Frank, J. P., & Co., Inc., 11 E. 26th St., New York 10, N. Y.
Frank Plastics Corp., 91 Pallister St., Detroit 2, Mich.
•Frank, Walter, Organization, The, 4100 Warren Ave., Hillside, Ill.
Frankel Associates, Inc., 56 W. 45th St., New York 36, N. Y.
Frankel, Cele, Studio, 737 N. Michigan Ave., Chicago 11, Ill.
Franklin Folding Box Co., Inc., 1914 W. 14th St., Chicago 8, Ill.
Franklin Glue Co., 119 W. Chestnut St., Columbus 15, Ohio
Franklin Plastics, 5915 Blackwelder St., Culver City, Calif.
Franklyn Folding Box Co., Inc., 35-11 Prince St., Flushing 58, N. Y.
Frann Paper Corp., 450 Park East Dr., Garden City East, N. Y.
Franz, Richard Max, 19801 Pinecrest Dr., Waukesha, Wis.
Fraser Paper, Ltd., 420 Lexington Ave., New York 17, N. Y.
•Frazier & Son, 20 Industrial West St., Allwood, Clifton, N. J.
Freedman Die Cutters, Inc., 285 Lafayette St., New York 12, N. Y.
Freedman, Leonard, & Sons, 1133 Broadway, New York 10, N. Y.
Freeman, Nathaniel H., 11 E. 48th St., New York 17, N. Y.
Freeman Paper Box Co., Inc., 264 Lee Ave., Brooklyn 16, N. Y.
French-Bray Printing Co., The, Candler Bldg., Baltimore 2, Md.
Fretz Box Co., Route 309, Souderton, Pa.
Freund Can Co., Inc., 4445 Cottage Grove Ave., Chicago 53, Ill.
Freund, Paul T., Corp., 1024 Garson Ave., Rochester 3, N. Y.
Frey, Louis, Sales Organization, 20 Branford Place, Newark 2, N. J.
Friedel, J. F., Paper Box Co., 304-318 W. Second St., East Syracuse, N. Y.
Friedman Art Displays, 1151 Broadway, New York 1, N. Y.
Friend Box Co., 90 High St., Danvers, Mass.
Frostad Engineering Co., 3037 S. Wentworth Ave., Milwaukee 7, Wis.
Frostee Sno Co., 362 Depot St., Antioch, Ill.
•Fry, George H., Co., 42 E. Second St., Mineola, N. Y.
Fujimoro Kogyo Co., Ltd., Katsuragi Bldg., 1, Kanda, Higashi Imagawa-cho, Chiyoda-ku, Tokyo, Japan
Fuld Bros., Inc., 702 S. Wolfe St., Baltimore 31, Md.
Fuller Displays, Inc., 5-39—48th Ave., Long Island City 1, N. Y.
•Fuller, H. B., Co., 1150 Eustis St., St. Paul 8, Minn.
Fulton Cotton Mills, P.O. Box 1726, Atlanta 1, Ga.
Fulton Machine Co., 16 N. Morgan St., Chicago 7, Ill.

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G. & B. Bakers Supply Corp., 2001 Tonnelle Ave., No. Bergen, N. J.
G & D Novelty Co., Inc., 31 Bond St., New York 12, N. Y.
GPE Controls, Inc., 240 E. Ontario St., Chicago 11, Ill.
Gabe-Bert Crafts, Inc., 156 S. Broadway, Yonkers 5, N. Y.
Gabriel Mfg. Co., Maple & Fairmont Aves., Haverstraw, N. Y.
Gaedke, Ray, 116 S. Michigan Ave., Chicago 3, Ill.
Gaetjens, Berger & Wirth, Inc., 35 York St., Brooklyn 1, N. Y.
Gambon, Thomas F., Assoc., 337 N. Euclid Ave., St. Louis 8, Mo.
Gamper Printing & Bronzing Co., Inc., 145 Hudson St., New York 13, N. Y.
Gamse Lithographing Co., Inc., 7413 Pulaski Hwy., Baltimore 6, Md.
Ganz Brothers, Inc., 52-54 New Bridge Road, Bergenfield, N. J.
Gard Industries, Inc., 1739 Harding Road, Northfield, Ill.
Gardiner Paper Mills, Inc., Gardiner, Maine
•Gardner Div., The, Diamond National Corp., 407 Charles St., Middletown, Ohio
Gardner Laboratory, Inc., P.O. Box 5728, Bethesda 14, Md.
Gardner-Brooks, Inc., Sub. Diamond National Corp., 140 Wilbraham Ave., Springfield 9, Mass.
Garray Plastics, Inc., 333 Bergen Ave., Kearny, N. J.
Gartemann & Hollmann Maschinenfabrik, Goldbach 6, Bielefeld, Germany
Gary Enterprises, Inc., 999 Alabama Ave., Brooklyn 7, N. Y.
Gast Mfg. Corp., Box 117, Benton Harbor, Mich.
Gates, N. T., Co., 6845 Westfield Ave., Pennsauken, N. J.
Gay Sales Co., Inc., P. O. Box 13232, Houston 19, Texas
Gaylord Container Div., Crown Zellerbach Corp., 111 N. Fourth St., St. Louis 2, Mo.
Gayner Glass Works, Div. Star City Sales Co., 32 West Broadway, Salem, N. J.
Gaynes Engineering Co., 1642 West Fulton St., Chicago 12, Ill.
Geigy Industrial Chemicals, Div. Geigy Chemical Corp., Saw Mill River Rd., Ardsley, N. Y.
Geissel Mfg. Co., Inc., 203 Central Ave., Hillside, N. J.
Gellman Manufacturing Co., 1700 First St., Rock Island, Ill.
Gem Corrugated Box Corp., 555 W. 23rd St., New York 11, N. Y.
Gemloid Corp., 38-40 Tenth St., Long Island City 1, N. Y.
Gendron Mfg. Co., Fair Oak St., Moosup, Conn.
General Adhesives & Chemical Co., P. O. Box 90, Nashville, Tenn.
General Aerosols, Inc., 104 Mill St., Shelton, Conn.
General Aniline & Film Corp.
General Offices, 111 W. 50th St., New York, N. Y.
Antara Chemicals Div., 435 Hudson St., New York 14, N. Y.
General Dyestuff Co., Div., 435 Hudson St., New York 14, N. Y.
General Bag Equipment Corp., 3362 W. 137th St., Cleveland 11, Ohio
General Box Co., 1825 Miner St., Des Plaines, Ill.
General Box Distributors, P.O. Box 112, Fresno 12, Calif.
General Carton Co., 2444 Baldwin Road, Cleveland 4, Ohio
General Case Corp., 580 Fifth Ave., New York 36, N. Y.
•General Chemical Div., Allied Chemical Corp., 40 Rector St., New York 6, N.Y.
General Converting & Laminating Corp., P.O. Box 8193, Oakland 8, Calif.
•General Corrugated Machinery Co., Inc., 141 W. Central Blvd., Palisades Park, N. J.
General Display Case Co., Inc., 63 Greene St., New York 12, N. Y.
General Dyestuff Co., Div. General Aniline & Film Corp., 435 Hudson St., New York 14, N. Y.
General Electric Co.
General Offices, 1 River Rd., Schenectady 5, N. Y.
Apparatus Sales Div., 1 River Rd., Schenectady 5, N. Y.
Chemical Materials Dept., 1 Plastics Ave., Pittsfield, Mass.
Silicone Products Dept., Waterford-Mechanicville Rd., Waterford, N. Y.
Specialty Control Dept., P.O. Box 812, Waynesboro, Va.
X-Ray Dept., 4855 Electric Ave., Milwaukee 1, Wis.
•General Felt Products Div., Standard Packaging Corp., 68—35th St., Brooklyn 32, N. Y.
General Fibre Co., 217 Cedar St., St. Louis 2, Mo.
General Fibre Products Corp., 73-35 Woodhaven Blvd., Brooklyn 27, N. Y.
General Fibrebox Corp., Springfield, Mass.
General Films, Inc., Covington, Ohio
General Foam Corp., 640 W. 134th St., New York 31, N. Y.
General Foam Plastics Corp., 801 Mount Vernon Ave., Portsmouth, Va.
General Foods Corp., Carton & Container Div., E. Michigan & Grenville St., Battle Creek, Mich.
General Gravure Service Co., 1413 Chestnut Ave., Hillside 5, N. J.
General Gummed Products, Inc., 531 N. Stiles St., Linden, N. J.
General Latex & Chemical Corp., 666 Main St., Cambridge 39, Mass.
General Machinery Corp., 1831 N. 18th St., Sheboygan, Wis.
General Mills, Inc., Research Labs., 2010 E. Hennepin Ave., Minneapolis 13, Minn.
General Packaging Equipment Co., P. O. Box 19525, Houston 24, Texas
General Packaging Products, Inc., 1700 S. Canal St., Chicago 16, Ill.
General Packaging Service, Inc., 36 Midland Ave., E., Paramus, N. J.
General Plastics Corp., 55 La France Ave., Bloomfield, N. J.
General Plastics Corp., 12414 Exposition Blvd., Los Angeles 64, Calif.
General Printed String Co., 2511 S. Fourth St., Milwaukee 7, Wis.
•General Printing Ink Co., Div. Sun Chemical Corp., 750 Third Ave., New York 17, N. Y.
General Radio Co., 275 Massachusetts Ave., Cambridge 39, Mass.
General Research & Supply Co., 572 S. Division St., Grand Rapids 3, Mich.
General Staple Co., 28 E. 22nd St., New York 10, N. Y.
General Strapping Corp., 100 Park Ave., New York 17, N. Y.
General Tape Corp., First National Bank Bldg., St. Paul 1, Minn.
General Tire & Rubber Co., 1708 Englewood Ave., Akron 9, Ohio
General Trade Mark Co., Inc., 123 Prince St., New York 12, N.Y.
Genevamatic Engineering Corp., P. O. Box 10386, Tampa 9, Fla.
Genske Container, Inc., 3848 N. Port Washington Rd., Milwaukee 12, Wis.
George, P. D., Co., The, 5200 N. Second St., St. Louis 7, Mo.
Georgia-Pacific Paper Co., Equitable Bldg., Portland 4, Ore.
Gerald Carton Co., 16 Court St., Brooklyn 1, N. Y.
Gerbereux, Dufft & Kinder, 80 Richards St., Brooklyn 31, N. Y.
Gering Plastics, N. Seventh St. & Monroe Ave., Kenilworth, N. J.
Germain's, Inc., 4820 E. 50th St., Los Angeles 58, Calif.
Gerow, Inc., Change Bridge Rd., Pine Brook, N. J.
Gerrard, A. J., & Co., 400 E. Touhy Ave., Des Plaines, Ill.
Gershen, Irvin J., 1877 Springfield Ave., Maplewood, N. J.
Geuder, Paeschke & Frey Co., 324 N. 15th St., Milwaukee 1, Wis.
Geveke & Co., Inc., 10 Havens St., Elmsford, N. Y.
Gianninoto, Frank, & Associates, Inc., 133 E. 54th St., New York 22, N. Y.
Gibbs Automatic Moulding Div., Pierce Industries, Inc., 1105 Fifth St., Henderson, Ky.
Gibbs Bros. Cooperage Co., Overton St., Hot Springs, Ark.
Gibbs-Brower Co., Inc., 10 Depot Plaza, White Plains, N. Y.
Gibraltar Corrugated Paper Co., Inc., 8101 Tonnelle Ave., No. Bergen, N. J.
Gibraltar Display Div., Mead Containers, Inc., 350 Warren St., Jersey City, N. J.
Gibson Associates, Inc., 390 North Ave. E., Cranford, N. J.
Gift Box Corp. of America, 225 Fifth Ave., New York 10, N. Y.
Gift Wrappings, Inc., 110 E. 129th St., New York 35, N. Y.
Gift Wrappings & Tyings Assn., 122 E. 42nd St., New York 17, N. Y.
Gigante Paper Box Corp., 789 Secaucus Road, Jersey City 7, N. J.
Gilbert, Jack M., Co., 131 E. 70th St., Kansas City 13, Mo.
Gilbert Mfg. Co., Inc., 24-20—46th St., Long Island City, N. Y.
Gilbert Plastics, Inc., Boright Ave., Kenilworth, N. J.
Gillon Co., Inc., The, 811 S. 53rd St., Philadelphia 43, Pa.
Gilman Brothers Co., The, Gilman 2, Conn.
Gilman Paper Co., 111 W. 50th St., New York 20, N. Y.
Gilson, Channing Wallace, 2046 Hillhurst Ave., Los Angeles 27, Calif.
Ginsburg Bros., Inc., 520 Columbia St., Somerville 59, Mass.
Gintzler, J. H., Press, 2655 Main St., Buffalo 14, N. Y.
Girder Process, Inc., 102 Hobart St., Hackensack, N. J.
Girdler Process Equipment Div., Chemetron Corp., 2820 W. Broadway, Louisville 11, Ky.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Gisriel, George L., 516 N. Charles St., Baltimore 1, Md.
Gits, J. P., Molding Corp., 4600 W. Huron St., Chicago 44, Ill.
Glaser, J. W., Corp., 35 Larkin Plaza, Yonkers, N. Y.
Glass Container Manufacturers Institute, Inc., 99 Park Ave., New York 16, N. Y.
Glass Containers Corp., 1747 W. Commonwealth Ave., Fullerton, Calif.
Glassine & Greaseproof Mfrs. Assn., 122 E. 42nd St., New York 17, N. Y.
Glassips, Inc., 23 W. Susquehanna Ave., Towson 4, Md.
Glave, K. L., & Associates, 319 Stark Court, St. Louis 19, Mo.
Gleason Industries, 737 Lairport St., El Segundo, Calif.
Glendale Package Machinery Corp., 88-61—76th Ave., Glendale 27, N. Y.

Glenfab Bag & Liner Co., Country Club Road, Glens Falls, N. Y.
Glengarry Processes, Inc., Box 30, Bay Shore, N. Y.
Glenn Electric Heater Corp., 254 Canal St., New York 13, N. Y.
Glenshaw Glass Co., Inc., 1101 Wm. Flynn Hwy., Glenshaw, Pa.
Glidden Co., The, 900 Union Commerce Bldg., Cleveland 14, Ohio
Globe Co., The, 4000 S. Princeton Ave., Chicago 9, Ill.
Globe Container Co., 900 Industrial Rd., San Carlos, Calif.
Globe Envelope Mfg. Co., 1632 Venice Blvd., Los Angeles 38, Calif.
Globe Envelopes Limited, 1070 Queen St. E., Toronto 8, Ont., Canada
Globe Imperial Corp., 2025 Kishwaukee St., Rockford, Ill.
•Globe Industries, Inc., 1317 Brown St., Philadelphia 23, Pa.
Globe Manufacturing Co., 2009 Kinsey St., Philadelphia 24, Pa.
Globe Paper Box Co., 14th St. & Damen Ave., Chicago 8, Ill.
Globe Ticket Co., 112 N. 12th St., Philadelphia 7, Pa.
Glo-Brite Foam Plastics, Inc., 6415 N. California Ave., Chicago 45, Ill.
Gloco Products Corp., 87-52 Lefferts Blvd., Richmond Hill 18, N. Y.
Glue-Fast Equipment Co., Inc., 11 White St., New York 13, N. Y.
Gluetools, Inc., 2050 N. Meridian St., Indianapolis 2, Ind.
Glyco Chemicals, Div. Chas. L. Huisking & Co., Inc., 417 Fifth Ave., New York 16, N. Y.
Gold Leaf & Metallic Powders, Inc., 145 Nassau St., New York 38, N. Y.
Golden State Box Factory, 1200 E. Eighth St., Los Angeles 21, Calif.
Goldman, Harry, Co., 4747 Bronx Blvd., New York 70, N. Y.
Goldmark Plastic Compounds, Inc., 4-05–26th Ave., Long Island City 2, N. Y.
Goldsholl, Morton, Design Associates, Inc., 201 N. Wells St., Chicago 6, Ill.
Gomar Mfg. Co., Inc., 1051 W. Blancke St., Linden, N. J.
Gondert & Lienesch, Inc., 29 Wayne Ave., Dayton 2, Ohio
Goodbar Mfg. Co., Div. Hargood Ribbon Co., Inc., 114 E. 32nd St., New York 16, N. Y.
Goodman, L. A., Mfg. Co., 131-145 W. 63rd St., Chicago 21, Ill.
Goodren Products Corp., 101 W. Forest Ave., Englewood, N. J.
Goodrich, B. F., Chemical Co., 3135 Euclid Ave., Cleveland 15, Ohio
Goodrich, B. F., Co., The, 500 S. Main St., Akron, Ohio
Goodrich, B. F., Co., Package Cushioning Div., Shelton, Conn.
Goodrich, B. F., Industrial Products Co., 500 S. Main St., Akron 18, Ohio
•Goodrich-Gulf Chemicals, Inc., 1717 E. Ninth St., Cleveland 14, Ohio
Goodwin, Harry, 1716 Laurel St., So. Pasadena, Calif.
•Goodyear Tire & Rubber Co., The, 1144 E. Market St., Akron 16, Ohio
Goodyear Tire & Rubber Co., The, Chemical Div., 1485 Archwood Ave., Akron 16, Ohio
Gordon Cartons, Inc., 1629 Warner St., Baltimore 30, Md.
Gordon, L., & Son, Inc., 1050 S. Paca St., Baltimore 30, Md.
Gordon-Lacey Chemical Products Co., Inc., 57-02–48th St., Maspeth 78, N. Y.
Gore, Fred M., 2808 Oak Lawn, Dallas 19, Texas
Goss Printing Press Co., Div. Miehle-Goss-Dexter, Inc., 5601 W. 31st St., Chicago 50, Ill.
Gotham Industries, 540 N. Orleans St., Chicago, Ill.
Gotham Ink & Color Co., Inc., 5-19–47th Ave., Long Island City 1, N. Y.
Gotham Plastics Co., Inc., 220 E. 134th St., Bronx 51, N. Y.
•Gottscho, Adolph, Inc., 6 Evans Terminal, Hillside 5, N. J.
Gould & Associates, Inc., 306 N. Doheny Drive, Los Angeles 48, Calif.
Gould, Jerome F., Corp., 200 Stewart Ave., Brooklyn 37, N. Y.
Gould, Stephen, Paper Co., Ogdam St. & E. 46th St., Bayonne, N. J.
Grace, W. R., & Co.
General Offices, 7 Hanover Sq., New York, N. Y.
Cryovac Div., 62 Whittemore Ave., Cambridge 40, Mass.
Davison Chemical Div., 101 N. Charles St., Baltimore 3, Md.
Dewey & Almy Chemical Div., 62 Whittemore Ave., Cambridge 40, Mass.
•Polymer Chemicals Div., 225 Allwood Road, Clifton, N. J.
Gra-Dear Press, Inc., 208 S. Jefferson St., Chicago 6, Ill.
Graeber Stringing & Wiring Machine Co., 233 Central Ave., Hawthorne, N. J.
Graf Demoney Associates, 510 Piermont Road, Closter, N. J.
Grafflin Bag Co., Inc., 1407 Philpot St., Baltimore 31, Md.
Graficon, Inc., 141 E. 44th St.,, New York 17, N. Y.
Grand Bag & Paper Co., Inc., Hi-Land Paper Products Div., 2 South St., Mt. Vernon, N. Y.
Grand-City Container Corp., 2001 Tonnelle Ave., No. Bergen, N. J.
Graphic Arts Label Co., 1734 E. El Paso St., Fort Worth 1, Texas
Graphic Calculator Co., 633 Plymouth Court, Chicago 5, Ill.
Grasty Pallet Corp., Orange, Va.
Gravure Cylinder Corp., 1422 Grand St., Hoboken, N. J.
Gray Co., Inc., 1070 Sibley St. N.E., Minneapolis 13, Minn.
Gray Wire Specialty Co., The, 1761 E. 39th St., Cleveland 14, Ohio
Graymills Corp., 3705 N. Lincoln Ave., Chicago 13, Ill.
Gray-Way Advertising Displays, Inc., 3727 N. Palmer St., Milwaukee 12, Wis.
Great American Plastics Co., Factory St., Nashua, N. H.
Great Lakes Box Co., Div. St. Regis Paper Co., 7275 Wentworth Ave., Cleveland, Ohio
Great Lakes Filling Corp., 23400 Park St., Dearborn, Mich.
Great Lakes Runway & Engineering Co., 4137 N. Rockwell St., Chicago 18, Ill.
Great Lakes Stamp & Mfg. Co., 2500 Irving Park Road, Chicago 18, Ill.
Green Bay Box Co., 831 Doblon St., Green Bay, Wis.
Green Bay Tissue Mills, 614 Northern Bldg., Green Bay, Wis.
Green Brothers, Inc., 213 Valley St., East Providence 14, R. I.
Green, Frank W., Co., 156 Pleasant St., East Longmeadow, Mass.
Greenfield, David S., 3143 Decatur Ave., Bronx 67, N. Y.
Greenfield Paper Box Co., 55-57 Pierce St., Greenfield, Mass.
Greenspan Engraving Co., 775 Sixth Ave., New York 1, N. Y.
Greenwood Packaging Supply Co., 859-879 Summer Ave., Newark 4, N. J.
Greer, J. W., Co., Main & Eames Sts., Wilmington, Mass.
Greggory, Inc., 203 N. Wabash Ave., Chicago 1, Ill.
Gregory Packaging, Inc., P.O. Box 82, New York 51, N. Y.
Gregstrom Corp., 14 Davis St., Cambridge 39, Mass.
•Greif Bros. Cooperage Corp., The
General Offices, Pennsylvania Ave., Delaware, Ohio
Bettis, H., Div., 1043 Muskingum Ave., Zanesville, Ohio
Seymour & Peck Div., 2341 W. 135th Place, Blue Island, Ill.
Virginia Barrel Div., 178 Holland Ave., Staten Island 3, N. Y.
Greylock Paper Box Co., 360 Columbus Ave., Pittsfield, Mass.
•Griffin-Rutgers, Inc., 14 Harwood Court, Scarsdale, N. Y.
Griffith Laboratories, 1415 W. 37th St., Chicago, Ill.
Grigoleit Co., The, 740 E. North St., Decatur, Ill.
Grigsby Bros. Paper Box Mfrs., 817 N.E. Madrona St., Portland 11, Ore.
Grimes, Rose C., 1 Gracie Terrace, New York 28, N. Y.
Griswold Engineering Ltd., 146 Bates Road, Montreal, Que., Canada
Grove, Miles R., 2 E. 54th St., New York 22, N. Y.
Grover, Frederic S., Associates, 42 East Ave., Rochester 4, N. Y.
Growers Container Corp., P.O. Box 1211, Salinas, Calif.
Gruber Display Co., 205 W. 19th St., New York 11, N. Y.
Gruen, Robert, Associates, 509 Madison Ave., New York 22, N. Y.
Guard All Chemical Co., Inc., 350 Ely Ave., So. Norwalk, Conn.
Guard Coatings Corp., 8-05–43rd Ave., Long Island City 1, N. Y.
Guardian Paper Co., 2401 Central Ave., Newark, Calif.
Guardian Safety Seal Co., 919 N. Michigan Ave., Chicago 11, Ill.
Guide Co., The, Broad & Court Sts., Canfield, Ohio
Guild Molders, Inc., 42 Hayes St., Elmsford, N. Y.
Guilford Folding Box Co., The, Ashland Ave. & Haven St., Baltimore 5, Md.
Gulf Carton Div., St. Regis Paper Co., P.O. Box 486, Pensacola, Fla.
Gulliksen, Wm. M., Mfg. Co., Rear 37 Walnut St., Newton Lower Falls 62, Mass.
Gulton Industries, Inc., Vibro-Ceramics Div., 212 Durham Ave., Metuchen, N. J.
Gummed Industries Assn., Inc., The, 11 W. 42nd St., New York 36, N. Y.
Gummed Products Co., The, Div. St. Regis Paper Co., 421 S. Union St., Troy, Ohio
Gummed Tape & Devices Co., 66 York St., Jersey City 2, N. J.
•Gump, B. F., Co., 1325 S. Cicero Ave., Chicago 50, Ill.
Gussow, Mel, Associates, 590 Fifth Ave., New York 36, N. Y.
Gutmann, Ferdinand, & Co., 3611–14th Ave., Brooklyn 18, N. Y.
Guyer, Reynolds, 1821 University Ave., St. Paul 4, Minn.

H

"HH" Manufacturers, 2224 Cerritos Ave., Long Beach 2, Calif.
H. & H. Products, 1930 S. State St., Chicago 16, Ill.
H-P-M Div., Koehring Co., Marion Road, Mount Gilead, Ohio

H & R Plastics Industries, Inc., Route 45, Nazareth, Pa.
H & W Machinery Corp., 127-08–91st Ave., Richmond Hill 18, N. Y.
Haas Laminator Corp., 110 E. 31st St., New York 16, N. Y.
Haberland, William E., 11 Oakridge Road, Bloomfield, N. J.
Habgood, Warren J., Co., 37 Millbourne Ave., Millbourne, Pa.
Haida Engineering Co., 34-11 Vernon Blvd., Long Island City 6, N. Y.
Hainline, Wallace F., Associates, 515 Madison Ave., New York 22, N. Y.
Haiss, George, Mfg. Co., Div. Pettibone Mulliken Corp., 350 Fifth Ave., New York, N. Y.
•Hale & Kullgren Plastics Dept., The Black-Clawson Co., 613 E. Tallmadge Ave., Akron 10, Ohio
Hall, Frances Cushing, 2613½ Providence Road, Charlotte 7, N. C.
Halltown Paper Board Co., Halltown, W. Va.
Halsell Brokerage Co., 3101 Walnut St., Denver 5, Colo.
Hamac-Hansella Machinery Corp., Grand & Ruby Aves., Palisades Park, N. J.
•Hamac-Hansella Maschinen GmbH, Berliner Allee 61, Dusseldorf, Germany
Hamachek, Frank, Machine Co., 97 Ellis St., Kewaunee, Wis.
Hamburger Mineralol-Werke Ernst Jung, Ballindamm 17, Hamburg, Germany
Hamer Machine Co., 607 Marquette Ave., Minneapolis 2, Minn.
•Hamersley Manufacturing Co., The, 65 River Drive, Garfield, N. J.
Hamilton Caster & Mfg. Co., The, 1503 Dixie Hwy., Hamilton, Ohio
Hamilton Tool Co., The, Ninth & Hanover Sts., Hamilton, Ohio
Hamlen, J. H., & Son, Inc., 2005 E. 17th St., Little Rock, Ark.
Hammer Lithograph Corp., 425 Exchange St., Rochester 8, N. Y.
Hampden Glazed Paper & Card Co., 100 Water St., Holyoke 1, Mass.
Hampton Mfg. Co., Industrial Tape Div., 111 Cedar St., New Rochelle, N. Y.
Hampton Products Co., Hester St., Portland, Pa.
Hancor, Inc., 386 Park Ave. S., New York 16, N. Y.
Handel-Davies Co., 2626 Noble Road, Cleveland 21, Ohio
Hankins Container Co., Div. The Flintkote Co., 14801 Emery Ave., Cleveland 35, Ohio
Hanncon Machine Co., Inc., 180 Lafayette St., New York 13, N. Y.
Hanover Cordage Co., E. Chestnut St., Hanover, Pa.
Hapa A. G., Feefeldstrasse 331, Zurich, Switzerland
Harco Industries, Inc., 20 Curtice St., Rochester 5, N. Y.
Harcord Mfg. Co., Inc., 125 Monitor St., Jersey City 4, N. J.
Harder Partitions, Inc., 110 N. Second St., Dundee, Ill.
Hardig Industries, So. Hadley Falls, Mass.
Hardin Bag & Burlap Co., Inc., The, 1054 Constance St., New Orleans 7, La.
Harkin Affiliates, Inc., 95 Madison Ave., New York 16, N. Y.
Harley Bag Co., Inc., Spartanburg, S. C.
•Harley, E. L., Inc., 8701 Third Ave., Brooklyn 9, N. Y.
Harley Earl Associates, 28820 Mound Road, Village Station, Warren, Mich.
Harmony House Press, 3 Park Place, New York 7, N. Y.
Harnischfeger Corp., 4400 W. National Ave., Milwaukee 46, Wis.
Harris-Seybold Co., Div. Harris-Intertype Corp., 4510 E. 71st St., Cleveland 5, Ohio
Hart-Moisture-Meters, 336 W. Islip Blvd., West Islip, N. Y.
Harte & Co., Inc., 16 E. 34th St., New York 16, N. Y.
Hartford City Paper Div., Minnesota Mining & Mfg. Co., 900 Bush Ave., St. Paul 6, Minn.
•Hartig Extruders, Waldron-Hartig Div., Midland-Ross Corp., P.O. Box 531, Westfield, N. J.
Hartley, Paul, Cavalry Road, Weston, Conn.
Hartung, A., & Co., Inc., Richmond & Norris Sts., Philadelphia 25, Pa.
Harvey, Guy P., & Son Corp., 40 Spruce St., Leominster, Mass.
Haslett Chute & Conveyor Co., Oaks, Pa.
Hassler, W. Scott, Associates, Inc., 112 W. Kinzie, Chicago, Ill.
Hastings & Co., Inc., 2314 Market St., Philadelphia 1, Pa.
Hauck, Philip, & Son, Inc., 501 General Patterson Drive, Glenside, Pa.
Hauser, Jon W., Inc., St. Charles Natl. Bank Bldg., St. Charles, Ill.
Haveg Industries, Inc., Blow-Molding Div., Chimney Rock Road, Bound Brook, N. J.
Haveg Industries, Inc., Hav-A-Tray Div., Taunton, Mass.
Hawley-Monk Co., The, 212 N. Bentalou St., Baltimore 23, Md.
Hayes, John S., 3549 Taft St., Wantagh, N. Y.
•Hayssen Manufacturing Co., 1305 St. Clair Ave., Sheboygan, Wis.
•Hazel-Atlas Glass Div., Continental Can Co., Inc., 15th & Jacob Sts., Wheeling, W. Va.
Hazen Paper Co., 208 Race St., Holyoke, Mass.
Heaphy, Charles F., 420 Lexington Ave., New York 17, N. Y.
Heat Sealing Equipment Mfg. Co., 3409 Superior Ave., Cleveland 11, Ohio
Hedu, Jon, Watertown, Conn.
•Hedwin Corp., 609 Fifth Ave., New York 17, N. Y.
Heekin Can Co., The, 429 New St., Cincinnati 2, Ohio
Heidelberg Eastern, Inc., 73-45 Woodhaven Blvd., Glendale 27, N. Y.
Heidi Plastics Corp., 45 Prospect St., Yonkers, N. Y.
Heil Process Equipment Corp., 12901 Elmwood Ave., Cleveland 11, Ohio
•Heinrich Equipment Corp., 111 Eighth Ave., New York 11, N. Y.
Helix Machine Co., Inc., 315 New South Rd., Hicksville, N. Y.
Heller Roberts Instruments Corp., 6115 Carnegie Ave., Cleveland 3, Ohio
Heller & Usdan, Inc., 401 Washington St., New York 13, N. Y.
Helmold, J. F., & Bro., Inc., 1462 Shakespeare Ave., Chicago 14, Ill.
Help, Inc., 122 W. Kinzie St., Chicago 10, Ill.
Heminway Corp., 155 S. Leonard St., Waterbury, Conn.
Hendershot Inks, Ltd., 240 Logan Ave., Toronto, Ont., Canada
Henle Wax Paper Mfg. Co., Inc., The, 1428 Longfellow Ave., Bronx 59, N. Y.
•Henlopen Mfg. Co., Inc., 178 Cook St., Brooklyn 6, N. Y.
Henry, E. L., Inc., 400 Eighth Ave., New York, N. Y.
Henry, Ira L., Co., 802 Elm St., Watertown, Wis.
Henschel, C. B., Mfg. Co., 229 W. Mineral St., Milwaukee 4, Wis.
•Herbert Products, Inc., 172 Linden Ave., Westbury, N. Y.
Hercules Powder Co., Inc., Hercules Tower, Wilmington 99, Del.
Heresite & Chemical Co., 822 S. 14th St., Manitowoc, Wis.
Herlan, F., Machinery Corp., 104 E. 40th St., New York 16, N. Y.
Hermetite Corp., 245 Paterson Plank Road, Carlstadt, N. J.
Hermsdorf Industries, Inc., 108 Franklin St., Manchester, N. H.
Herrick, Wm. C., Ink Co., Inc., 1 Maple St., East Rutherford, N. J.
Herz Mfg. Div., American Seal-Kap Corp., 840 E. 134th St., New York 54, N. Y.
Hess & Barker, 930 Washington Ave., Philadelphia 47, Pa.
•Hesser, Fr., Maschinenfabrik A. G., Nauheimer Strasse 99, Stuttgart-Bad Cannstatt, Germany
Hewitt, C. B., & Bros., Inc., 23-25 Greene St., New York 13, N. Y.
Hewitt-Robins, Inc., 666 Glenbrook Road, Stamford, Conn.
Hewson Co., Inc., The, 443 Broad St., Newark 2, N. J.
Heywood, R. R., Co., Inc., 263 Ninth Ave., New York 1, N. Y.
Hickok, W. O., Mfg. Co., The, Ninth & Cumberland Sts., Harrisburg, Pa.
High Vacuum Mfg. Corp., 40 Worth St., New York 13, N. Y.
Highland Printers & Plastic Molders, 1434 W. Colorado Blvd., Pasadena 2, Calif.
Highland Supply Corp., 1111 Sixth St., Highland, Ill.
Hightower Box & Tank Co., 906 N. 40th St., Birmingham 12, Ala.
Hile, W. K., Co., Inc., 1236 E. Morehead St., Charlotte 7, N. C.
Hill Manufacturing Co., Inc., Box 105, Lyndonville, Vt.
Hill & Neumann Co., 455 Third St., Jersey City 2, N. J.
Hill-Hentschel Co., 3928 Clayton Ave., St. Louis 10, Mo.
Hill, Thomas, Engineering Co., (Hull), Ltd., The, 247/9 Beverly Road, Hull, Yorkshire, England
Hills, A. C., & Co., 260 S. 20th St., Newark 3, N. J.
Hilsher Paper Box Co., 254 Schuyler Ave., Kingston, Pa.
Hinckley, M. C., Associates, 113 E. Washington Ave., Bridgeport 3, Conn.
Hinde & Dauch, Div. West Virginia Pulp & Paper Co., 407 Decatur St., Sandusky, Ohio
Hines Pallet & Reel Co., 631 West St., Mount Airy, N. C.
Hirzel, Charles K., 17 E. 49th St., New York 17, N. Y.
Hi-Speed Checkweigher Co., Inc., 605 W. State St., Ithaca, N. Y.
Hitt, H. R., Lumber Co., Inc., P.O. Box 58, Tunkhannock, Pa.
Hively, Borden, 1279 Edgehill Road, Columbus 12, Ohio
Hoague-Sprague Corp., 130 Eastern Ave., Lynn, Mass.
•Hobbs Manufacturing Co., 26 Salisbury St., Worcester 5, Mass.
Hobson Miller Paper Co., 280 Lafayette St., New York 12, N. Y.
Hodges, Guy, 331 Madison Ave., New York 17, N. Y.
•Hoerner Boxes, Inc., 600 Morgan St., Keokuk, Iowa
Hofliger & Karg, Waiblingen bei Stuttgart, Germany
Hofmann, Alfred, & Co., 635–59th St., West New York, N. J.
Hofmann & Leavy, Inc., 826 Broadway, New York 3, N. Y.
Hofmann & Schwabe K. G., Wilhelmshofallee 96, Krefeld, Germany
Holland Insulated Wire & Cable Works Ltd., Hamerstraat 2-4, Amsterdam, Holland

Holley Plastics Co., 11955 E. Nine Mile Road, Warren, Mich.
Hollinger Corp., 3810 S. Four Mile Run Drive, Arlington 6, Va.
Hollingshead, R. M., Corp., Litho Can Div., 840 Cooper St., Camden, N. J.
•Hollingsworth & Whitney Div., Scott Paper Co., International Airport, Philadelphia 13, Pa.
Hollis, Morton, 669 Boylston St., Boston 16, Mass.
Holmes, T. J., Co., Inc., Chartley, Mass.
Holstein, Lee, Injection Molding, Inc., 53 Orchard St., Clifton, N. J.
Holyoke Card & Paper Co., 95 Fisk Ave., Springfield 7, Mass.
Holyoke Coated & Printed Paper Co., Inc., 8 Astor Place, New York 3, N. Y.
Holyoke Die Cut Card Co., Inc., 541 Main St., Holyoke, Mass.
Homer-Alden Co., 10 Maple Ave., No. Attleboro, Mass.
Hooper, F. X., Box Machinery Dept., Koppers Co., Glenarm, Md.
Hooper, J. R., Co., 9250 Southview St., Brookfield, Ill.
Hope Paper Box Co., 10-12 Beach St., Providence 8, R. I.
Hope Paper Co., Inc., 292 Ellery St., Brooklyn 6, N. Y.
Hopp Plastics, 460 W. 34th St., New York 1, N. Y.
Hopple Plastics, Inc., 1014 Broadway, Cincinnati 2, Ohio
•Horix Manufacturing Co., 2601 Chartiers Ave., Pittsburgh 4, Pa.
Horne, E. C., Machinery Co., 1726 Champa St., Denver 2, Colo.
Horne Machinery Co., Inc., 1188 Harrison St., San Francisco 3, Calif.
Hornney & Co., 420 Lexington Ave., New York 17, N. Y.
Hornung, Clarence P., 220 E. 46th St., New York, N. Y.
House of Harley, Inc., The, 10 E. 40th St., New York 16, N. Y.
House of More, The, 1475 Folsom St., San Francisco 3, Calif.
Howard Plastics Co., Inc., 251 Florence St., Leominster, Mass.
Howe Scale Co., The, Strongs Ave., Rutland, Vt.
•Howell, F. M., & Co., 79-95 Pennsylvania Ave., Elmira, N. Y.
Howell Warehouses Ltd., 156 Front St. W., Toronto 1, Ont., Canada
Huber, J. M., Corp., Ink Div., 1478 Chestnut Ave., Hillside, N. J.
Huck Co., 72 W. 45th St., New York 36, N. Y.
Hudson Pulp & Paper Corp., 477 Madison Ave., New York 22, N. Y.
•Hudson-Sharp Plant, FMC Corp., 1207 Main St., Green Bay, Wis.
Hueck & Buren, Postfach 7, Ludenscheid, Germany
Huff, M., & Co., 70 Blanchard St., Newark 5, N. J.
Hughes Glue Co., 3500 St. Aubin Ave., Detroit 7, Mich.
Hughes & Hoffman, 501 West Broadway, New York 12, N. Y.
Hull Pottery Co., 327 Amerine St., Crooksville, Ohio
Humidial Co., 465 Mt. Vernon Ave., Colton, Calif.
Humitube Mfg. Co., 233 N. Madison St., Peoria 2, Ill.
Hummell, A. C., Co., 5349 Kennedy Ave., Cincinnati 13, Ohio
Hunt, Harry E., Co., Ltd., 126 Sinnott Road, Scarboro, Ont., Canada
Hunter Spring Co., Div. American Machine & Metals, Inc., 1 Spring Ave., Lansdale, Pa.
Huntingdon Industries, Inc., 860 Welsh Road, Bethayres, Pa.
Hurwich, R., Co., 2546 Tenth St., Berkeley 10, Calif.
Hutchins, H. Wesley, Co., P.O. Box 415, Auburn, Maine
Hutchinson, W. H., & Son, Inc., 1031 N. Cicero Ave., Chicago 51, Ill.
Huxtable, L. Garth, 46 E. 76th St., New York 21, N. Y.
Huyck Industrial Controls, 755 Park Ave., Huntington Station, N. Y.
Hydrawlik Co., 131 E. First Ave., Roselle, N. J.
Hydrocarbon Chemicals, Inc., Plastic Div., Locust St., Keyport, N. J.
Hygrade Folding Box Corp., 92-00 Atlantic Ave., Ozone Park 16, N. Y.
Hy-Sil Mfg. Co., Spring & Prospect Aves., Revere 51, Mass.
Hyster Co., 2902 N.E. Clackamas St., Portland 8, Ore.

I

I. D. Company, 150 Spring St., New York 12, N. Y.
Ideal Fishing Float Co., Inc., 2001 E. Franklin St., Richmond 3, Va.
Ideal Gold Stamping Co., 990 Sixth Ave., New York, N. Y.
Ideal Packagings, Ltd., 1 Shrewsbury Road, London, N. W. 10, England
Ideal Packers, Inc., 196 West Broadway, New York 13, N. Y.
Ideal Plastics Div., Ideal Toy Corp., 184-10 Jamaica Ave., Hollis 7, N. Y.
Ideal Roller & Mfg. Co., 2512 W. 24th St., Chicago 8, Ill.
Ideal Stencil Machine Co., 102 Iowa Ave., Belleville, Ill.
Ideal Stitcher Co., Div. W. R. Pabich Mfg. Co., Inc., 2323 N. Knox Ave., Chicago 39, Ill.
Ideal Tape, Inc., 100 Whipple St., Lowell, Mass.
Iden, Wm., Cordage & Twine Co., 2700 N. Karlov Ave., Chicago 39, Ill.
Illinois Bronze Powder Co., Inc., 2023 S. Clark St., Chicago 16, Ill.
Illinois Cooperage Mfg. Co., 44th Place & S. Justine St., Chicago 9, Ill.
Illinois Plastic Molding & Mfg. Co., 2934 W. Medill, Chicago 47, Ill.
•Illumitronic Systems Corp., 680 E. Taylor Ave., Sunnyvale, Calif.
•Imco Container Co., 75th & Cleveland Sts., Kansas City 32, Mo.
Impact Container Corp., 11125 Walden Ave., Alden, N. Y.
Impact Extrusions, Ltd., Browell's Lane, Feltham, Middlesex, England
Impact-O-Graph Corp., The, 1621 Euclid Ave., Cleveland 15, Ohio
Imperial Adhesives, 6315 Wiehe Road, Cincinnati 13, Ohio
Imperial Chemical Industries Ltd., Imperial Chemical House, Millbank, London, S.W. 1, England
Imperial Molded Products Corp., 2856 W. Harrison St., Chicago 12, Ill.
Imperial Paper Box Corp., 252 Newport St., Brooklyn 12, N. Y.
Improved Machinery, Inc., Burke St., Nashua, N. H.
Improved Mailing Case Co., 51 E. 42nd St., New York 17, N. Y.
Independent Can Co., 934 S. Lakewood Ave., Baltimore 24, Md.
Independent Die & Supply Co., 2641 La Salle St., St. Louis 4, Mo.
Independent Stave Co., Inc., 960 S. Jefferson, Lebanon, Mo.
•Index Industrial Corp., 660 Madison Ave., New York 21, N. Y.
Indiana Carton Co., Inc., 2620 W. Sample St., South Bend 21, Ind.
Indianapolis Paper Container Corp., 217 W. Tenth St., Indianapolis 2, Ind.
Indianapolis Wire Bound Box Co., Fernwood, Miss.
Induction Heating Corp., 181 Wythe Ave., Brooklyn 11, N. Y.
Industrial Bag & Cover Div., National Flexible Packaging Assn., 11750 Shaker Blvd., Cleveland 20, Ohio
Industrial Container Corp., 50th St. & Second Ave., Brooklyn, N. Y.
Industrial Conveyor Co., 1336 W. Fullerton Ave., Chicago 14, Ill.
Industrial Fibre Drum Co., 4219 Whiteside St., Los Angeles 63, Calif.
Industrial Lithographic Co., Inc., 1425–37th St., Brooklyn 18, N. Y.
•Industrial Marking Equipment Co., Inc., 655 Berriman St., Brooklyn 8, N. Y.
Industrial Mineral Fiber Institute, 441 Lexington Ave., New York 17, N. Y.
Industrial Nucleonics Corp., 650 Ackerman Road, Columbus 2, Ohio
Industrial Packaging Installations Ltd., 785 Hornby St., Vancouver 1, B. C., Canada
Industrial Paper Sales Div., Crown Zellerbach Corp., 1 Bush St., San Francisco, Calif.
Industrial Plastic Supply Div., Industrial Safety Supply Co., Inc., 574 New Park Ave., W. Hartford 10, Conn.
Industrial Raw Materials Corp., 575 Madison Ave., New York 22, N. Y.
Industrial Research Engineering Co., 3232 W. Chicago Ave., Chicago, Ill.
Industrial Shredder & Cutter Co., 708 S. Ellsworth St., Salem, Ohio
Industrial Steel Container Co., 220 Eagle St., St. Paul 2, Minn.
Industrial Steel & Fibre Ltd., 1420 Sherbrooke St., W., Montreal 9, Que., Canada
Industrial Tape Printers, Div. Industrial Equipment & Supply Co., 6 West Penn Ave., Wernersville, Pa.
Industrial Testing Service, Div. American BioChemical Laboratory, 1113 N. Rolling Rd., Baltimore 28, Md.
Industrial Transparent Products Corp., 79 Mill Road, Freeport, N. Y.
•Industric-Werke Karlsruhe Aktiengesellschaft, Gartenstrasse 71, Karlsruhe, Germany
Inertia Switch, Inc., 311 W. 43rd St., New York 36, N. Y.
Ingersoll Studios, 4 W. 40th St., New York 18, N. Y.
Inglis, John T., Co., Fayetteville, N. Y.
•Injection Molders Supply Co., 17601 S. Miles Road, Cleveland 28, Ohio
Injection Molding Corp., 113 Fourth Ave., New York 3, N. Y.
Ink Corp. of America, 780 Wright Ave., Camden, N. J.
Inland Container Corp., 700 W. Morris St., Indianapolis 6, Ind.
Inland Folding Box Corp., 3434 S. La Salle St., Chicago 16, Ill.
Inland Lithograph Co., 328 S. Jefferson St., Chicago 6, Ill.
Inland Paper Products Corp., 320 E. 54th St., New York 22, N. Y.
Inland Steel Container Co., Div. Inland Steel Co., 6532 S. Menard Ave., Chicago 38, Ill.
Inland Wire Products Co., Wabash & Oak Sts., Crawfordsville, Ind.
Inlander Steindler Paper Co., 2700 N. Karlov Ave., Chicago 39, Ill.
Inman Mfg. Co., Inc., 41-53 Guy Park Ave., Amsterdam, N. Y.
Inpak Systems, Inc., 141 E. 44th St., New York 17, N. Y.
Institute of Food Technologists, 176 W. Adams St., Chicago 3, Ill.
Institute of Paper Chemistry, The, 1043 E. S. River St., Appleton, Wis.
Instrument Development Laboratories, Inc., 67 Mechanic St., Attleboro, Mass.
•Intaglio Service Corp., 305 E. 46th St., New York 17, N. Y.
Inta-Roto Engraving Corp., P.O. Box 454, Byrd Airport, Richmond 3, Va.

•Inta-Roto Machine Co., Inc., The, P.O. Box 454, Byrd Airport, Richmond 3, Va.
Integral Packaging Co., Box 518, Chicago Heights, Ill.
Interchemical Corporation
General Offices, 67 W. 44th St., New York 36, N. Y.
Finishes Div., 224 McWhorter St., Newark 5, N. J.
•Printing Ink Div., 67 W. 44th St., New York 36, N. Y.
Intercontinental Dynamics Corp., 170 Coolidge Ave., Englewood, N. J.
Intermediates Dept., American Cyanamid Co., Bound Brook, N. J.
International Banding Machine Div., Consolidated Lithographing Corp., Carle Place, N. Y.
International Conveyor & Washer Corp., 6440 Mack St., Detroit 7, Mich.
International Cooperage Co., Box 518, Hyde Park Blvd., Niagara Falls, N. Y.
International Eastern Co., 801 Sixth Ave., New York 1, N. Y.
International Folding Paper Box Co., Inc., 2029–83rd St., No. Bergen, N. J.
International Graphics, Inc., 620 N. Michigan Ave., Chicago 11, Ill.
•International Paper Box Machine Co., The, 315 Main St., Nashua, N. H.
•International Paper Co., 220 E. 42nd St., New York 17, N. Y.
International Processes, Inc., 624 S. Michigan Ave., Chicago 5, Ill.
International Staple & Machine Co., P.O. Box 270, Herrin, Ill.
International Ultrasonics, Inc., 331 Centennial Ave., Cranford, N. J.
International Wax Refining Co., 99 E. Hawthorne Ave., Valley Stream, N. Y.
Interplastics Corp., 76-11–37th Ave., Jackson Heights 72, N. Y.
Interstate Boochever Corp., 18-09 Pollitt Dr., Fairlawn, N. J.
Interstate Chemical Products Co., 1228 W. 12th St., Kansas City 5, Mo.
Interstate Container Corp., 70-27–80th St., Glendale 27, N. Y.
Interstate Folding Box Co., The, Verity Parkway, Middletown, Ohio
Inter-State Oil Co., Inc., 87 Shawnee Ave., Kansas City 19, Kan.
Interstate Printing Co., The, 3935 Laclede Ave., St. Louis 8, Mo.
Iowa Paper Box Co., Inc., 200 E. Court Ave., Des Moines 9, Iowa
Ironbound Box & Lumber Co., 42 Hoffman Place, Hillside, N. J.
Irwin Corp., 200 Fifth Ave., New York 10, N. Y.
Island Equipment Corp., 1090 E. 31st St., Hialeah, Fla.
Isocyanate Products, Inc., 900 Wilmington Road, New Castle, Del.
Ison Co., 1105 Spring St., N.W., Atlanta 9, Ga.
Isotube S. A., 108, Rue de Flandre, Paris, France
Ivers-Lee Co., 215 Central Ave., Newark 3, N. J.

J

"J" Chemical Works, 602 W. 37th St., New York 18, N. Y.
•J-E Plastics Mfg. Corp., 400 Nepperhan Ave., Yonkers 2, N. Y.
J G Machine Works, Inc., 452-458 W. 46th St., New York 36, N. Y.
J. P. Equipment Co., P.O. Box 386, Waterford, Wis.
Jack, Vern, & Associates, 38001 Lake Shore Blvd., Willoughby, Ohio
•Jackmeyer Corp., The, 253 W. 26th St., New York 1, N. Y.
Jackson, McStay, Co., 840 N. Michigan Ave., Chicago 11, Ill.
Jackson Paper Box Co., 1316 Wildwood Ave., Jackson, Mich.
Jackson, Thomas, & Son, Inc., Ninth & Oley Sts., Reading, Pa.
Jaco Equipment Corp., 3080 Main St., Buffalo 14, N. Y.
Jacobs, K. W., Cooperage Co., 1907 W. St. Paul Ave., Milwaukee 3, Wis.
Jacobson, S. I., Mfg. Co., 1414 S. Wabash Ave., Chicago 5, Ill.
Jacobsson, Edward Gustave, & Associates, 140 E. 46th St., New York 17, N. Y.
Jagenberg-Werke A.G., Himmelgeister Str. 107, Dusseldorf, 22a, Germany
Jaite Display Bag Co., The, 7029 Riverview Road, Peninsula, Ohio
Jamieson, Walter J., Corp., 140 N. Fitzhugh St., Rochester 14, N. Y.
Jamison Plastic Corp., The, 1255 New Bridge Road, No. Bellmore, N. Y.
Janesville Cotton Mills, P.O. Box 349, Norwalk, Ohio
Jardier Co., 1977 S. Allis St., Milwaukee 7, Wis.
Jarisch Paper Box Co., Inc., 2-12 Chestnut St., North Adams, Mass.
Java Latex & Chemical Corp., 1713 West Farms Road, New York 60, N. Y.
Jeffrey Mfg. Co., The, 828 N. Fourth St., Columbus 16, Ohio
Jensen, H. J., Inc., 350 Broadway, New York 13, N. Y.
Jepson, Tinsley T., 3860 Madison Rd., Flintridge, Calif.
Jessall Plastics, Div. Electric Storage Battery Co., 889 Farmington Ave., Kensington, Conn.
Jet Manufacturing Co., Inc., The, 288 Hyde Park Ave., Boston 30, Mass.
Jet Specialties Co., 941 N. Eastern Ave., Los Angeles 63, Calif.
Jet-Heet, Inc., 152 S. Van Brunt St., Englewood, N. J.
Jet-Pak, Inc., 859-879 Summer Ave., Newark 4, N. J.
Jewett, A. S., Rhinebeck, N. Y.
•Jiffy Manufacturing Co., 360 Florence Ave., Hillside, N. J.
Joa, Curt G., Inc., Clark St., Sheboygan Falls, Wis.
Johns-Manville, 22 E. 40th St., New York 16, N. Y.
Johns-Nigrelli-Johns, 7550 N. Linder Ave., Skokie, Ill.
Johnson, A., Machine Works, Inc., 437 Boulevard, East Paterson, N. J.
Johnson, Gordon, Co., 2517 Madison Ave., Kansas City, Mo.
Johnson, Will, Design, 600 W. Jackson Blvd., Chicago 6, Ill.
Johnsos-Coppock Co., 8026 Lawndale Ave., Skokie, Ill.
•Johnston Foil Mfg. Div., Standard Packaging Corp., 6100 S. Broadway, St. Louis 11, Mo.
Johnstone Engineering & Machine Co., First Ave. & Gay St., Parkesburg, Pa.
Joliet Plastic, Inc., 15 S. Joliet Ave., Joliet, Ill.
Jomac, Inc., 6128 N. Woodstock St., Philadelphia 38, Pa.
Jones Box & Mill Division, 35 Michigan St., No. Tonawanda, N. Y.
Jones, Charles E., & Associates, Inc., 7356 N. Cicero Ave., Lincolnwood 46, Ill.
Jones-Dabney Co., Rutherford & Delancey Sts., Newark 5, N. J.
Jones, E. Willis, 620 N. Michigan Ave., Chicago, Ill.
Jones-Hamilton Co., 8460 Wells Ave., Newark, Calif.
Jones, Jesse, Box Corp., Box 5120, Philadelphia 41, Pa.
Jones & Laughlin Steel Corp., 3 Gateway Center, Pittsburgh 30, Pa.
Jones & Laughlin Steel Corp., Container Div., 405 Lexington Ave., New York 17, N. Y.
•Jones, R. A., & Co., Inc., P.O. Box 485, Cincinnati 1, Ohio
Jonethis-Larson, 310 Fairmount Ave., Jamestown, N. Y.
Jordan Paper Box Co., 4223 W. Lake St., Chicago 24, Ill.
Jordan Tool & Machine Corp., 512 S. Fifth St., Milwaukee 4, Wis.
Joy of California, 148 E. Virginia St., San Jose 12, Calif.
Judelshon, Oscar I., Inc., 404 Tonnelle Ave., Jersey City 6, N. J.
Just Plastics, Inc., 250 Dyckman St., New York 34, N. Y.

K

KGA, Inc., 270 Madison Ave., New York, N. Y.
K & M Plastic Co., 510 St. Charles Rd., Maywood, Ill.
KVP Sutherland Paper Co., Kalamazoo, Mich.
Kabar Mfg. Corp., 180-B Babylon Turnpike, Roosevelt, N. Y.
Kage Co., Pine St., Manchester, Conn.
Kahlenberg-Globe Equipment Co., 1663 Eleventh St., Sarasota, Fla.
•Kaiser Aluminum & Chemical Sales, Inc., 300 Lakeside Drive, Oakland 12, Calif.
Kalamazoo Label Co., 321 W. Ransom St., Kalamazoo 12, Mich.
Kalamazoo Paper Box Corp., 391 S. Pitcher St., Kalamazoo, Mich.
Kalamazoo Paraffine Co., 1801-21 Reed St., Kalamazoo, Mich.
Kalamazoo Plastics Co., 1811 Factory St., Kalamazoo, Mich.
Kalle, A. G., Wiesbaden, Germany
Kaltman Press, Inc., 52-25 Barnett Ave., Long Island City 4, N. Y.
Kalyx Cups, Ltd., 1070 Queen St. E., Toronto 8, Ont., Canada
Kamp, Bruce, Associates, 1716 Spruce St., Philadelphia 3, Pa.
KamRu Products Corp., P.O. Box 706, Elyria, Ohio
Kankakee Container Co., Hobbie Ave. & Grinnell Road, Kankakee, Ill.
Kansas City Container Co., 2800 Mercier St., Kansas City 8, Mo.
Kansteiner, Walter H., Machinery Co., 2709 W. Howard St., Chicago 45, Ill.
Kantol Packaging Co., 915 N. Tenth St., St. Louis 1, Mo.
Kanty, C. L., Paper Box Corp., 140 Carter St., Rochester 21, N. Y.
Kapak Products Co., 130 S. Wabasha St., St. Paul 1, Minn.
Kaplan Paper Box Co., 130 S. Wabasha St., St. Paul 1, Minn.
Kardon Box Co., 226 Pine St., Philadelphia 6, Pa.
Karp Co., The, 123 First St., Jersey City 2, N. J.
Karr Engineering Service, Inc., 2920 W. Clybourn St., Milwaukee 8, Wis.
•Karstrom Co., 13400 W. Silver Spring Drive, Menomonee Falls, Wis.
•Kartridg Pak Co., The, 800 W. Central, Mount Prospect, Ill.
Kat-Lac Industries, Inc., 1753 S. Zeyn St., Anaheim, Calif.
Kaufman Hoag Co., 1133 Broadway, New York 10, N. Y.
Kaumagraph Co., 14th & Poplar Sts., Wilmington 99, Del.
Kautex-U. S. Sales Co., Inc., 133-10–32nd Ave., Flushing 54, N. Y.
Kay, Inc., 142 E. 49th St., New York 17, N. Y.
Kaye Plastics Corp., P.O. Box 1149, New Brunswick, N. J.
Kayton, Robert, Associates, Inc., 635 W. 54th St., New York 19, N. Y.

Keck, Henry, Associates, 245 Fair Oaks Ave., So. Pasadena, Calif.
Keeny, J. R., Co., 214 Biltmore Road, Louisville 7, Ky.
Kehlmann Printing Co., 151 W. 25th St., New York 1, N. Y.
Kehr Products Co., 535 Davisville Road, Willow Grove 10, Pa.
Keiding Paper Products Co., 4545 W. Woolworth Ave., Milwaukee 18, Wis.
Kelley & Hueber, Inc., 5253 Whitby Ave., Philadelphia 43, Pa.
Kellogg Container Div., United States Envelope Co., 21 Cypress St., Springfield, Mass.
Kellogg, M. W., Co., The, P.O. Box 469, Jersey City 3, N. J.
Kelsey-Hayes Co., Heintz Div., Front St. & Olney Ave., Philadelphia 20, Pa.
Kendall Co., The, Polyken Sales Div., 309 W. Jackson Blvd., Chicago 6, Ill.
Kendall Mfg. Co., Inc., 520 E. Erie St., Milwaukee 2, Wis.
Kenly, Inc., 1001 N. Tenth St., Terre Haute, Ind.
Kennedy Car Liner & Bag Co., Inc., Hodell & Prospect Sts., Shelbyville, Ind.
Kennedy Industries, Inc., 4447 Alger St., Los Angeles 39, Calif.
•Kensol-Olsenmark, Inc., 124-132 White St., New York 13, N. Y.
Kent, Percy, Bag Co., Inc., 5910 Winner Road, Kansas City 25, Mo.
Kent Plastics Corp., 1528 N. Fulton Ave., Evansville 10, Ind.
Kent, S. Jay, 605 Fifth Ave., New York 17, N. Y.
Keokuk Barrel Co., 30 N. Fifth St., Keokuk, Iowa
Keolyn Plastics, Inc., 2731 N. Pulaski Road, Chicago 39, Ill.
Kerr, Alexander H., & Co., Inc., 3440 Wilshire Blvd., Los Angeles 5, Calif.
Ketcham, Howard, Inc., 101 Park Ave., New York 17, N. Y.
Ketchpel Engineering Co., 1401 Palisade Ave., West Englewood, N. J.
Ketterlinus Lithographic Mfg. Co., 500 Mildred Ave., Primos, Pa.
Key Polymer Corp., 135 Bradford St., Lawrence, Mass.
•Keyes Fibre Co., Upper College Ave., Waterville, Maine
Keystone Box Co., P.O. Box 7821, Sharpsburg Sta., Pittsburgh 15, Pa.
Keystone Cap Co., Tenth & Blunston Sts., Columbia, Pa.
Keystone Folding Box Co., 367-373 Verona Ave., Newark 4, N. J.
Keystone Packaging Service, Inc., 555 Warren St., Phillipsburg, N. J.
Keystone Paper Box Co., York, Pa.
Keystone Printed Specialties Co., 321 Pear St., Scranton 5, Pa.
Key-Thay Co., The, Box 222, Emporia, Kan.
•Kidder Press Co., Inc., 121 Broadway, Dover, N. H.
Kiefer, Karl, Machine Co., The, 919 Martin St., Cincinnati 2, Ohio
Kieffer Paper Mills, Brownstown, Ind.
Kiernan-Hughes Co., 348 Ninth St., Jersey City 2, N. J.
Kimball, A., Co., 8 Rewe St., Brooklyn 11, N. Y.
Kimball Tyler Co., The, 261 S. Haven St., Baltimore 24, Md.
Kimberly-Clark Corp., N. Lake St., Neenah, Wis.
•Kimble Glass Co., Sub. Owens-Illinois Glass Co., P.O. Box 1035-36, Toledo 1, Ohio
Kindred, MacLean & Co., Div. The Progress Lithographing Co., 43-01—22nd St., Long Island City 1, N. Y.
Kinex Co., Inc., The, 15 Dale St., Needham Heights 94, Mass.
King, Charles E., & Co., 960 W. Chicago Ave., Chicago 22, Ill.
King Container Corp., 51 E. 42nd St., New York 17, N. Y.
King Sales & Engineering Co., 441 Folsom St., San Francisco 5, Calif.
King, Watts, Co., 3404 N. Figueroa St., Los Angeles 65, Calif.
King-Casey, Inc., 30 Rockefeller Plaza, New York 20, N. Y.
Kingman, E. B., Co., 96 Exchange St., Leominster, Mass.
Kirby-Cogeshall-Steinau Co., Inc., 606 E. Clybourn St., Milwaukee 2, Wis.
Kirchheimer Brothers Co., 429 W. Ohio St., Chicago 10, Ill.
Kirk, F. J., Molding Co., Inc., 140 Brook St., Clinton, Mass.
Kisco-Bip Corp., 196 Ashburton Ave., Yonkers, N. Y.
Kittredge, R. J., & Co., 14 N. Peoria St., Chicago 7, Ill.
Kiwi Coders Corp., 4027 N. Kedzie Ave., Chicago 18, Ill.
Klausner Cooperage Co., 5207 Grant Ave., Cleveland 4, Ohio
Klear-Form Pak, Inc., 611 Williams St., Baltimore 30, Md.
Kleartone Transparent Products Co., Inc., 686 Main St., Westbury, N. Y.
Kleen-Stik Products, Inc., 7300 W. Wilson Ave., Chicago 31, Ill.
Kleen-Stik Products Ltd., 21 Edgar Ave., Weston, Ont., Canada
Kleerpak Mfg. Co., 13051 Saticoy St., No. Hollywood, Calif.
Kleerwrap, Inc., 225 E. Hawley St., Mundelein, Ill.
Klein, A., & Co., Inc., 113-119 W. 17th St., New York 11, N. Y.
Kleinhans, Herbert F., Associates, 122 E. 42nd St., New York, N. Y.
Kleist & Co., 2507 S.E. Clinton St., Portland 2, Ore.
Kliklok, Automated Packaging Div., Atlas General Industries, Inc., 405 Lexington Ave., New York 17, N. Y.
Knotts Pallet Co., P.O. Box 247, Grafton, W. Va.
•Knowlton, M. D., Co., 28 Industrial St., Rochester 14, N. Y.
Knox Glass, Inc., Knox, Pa.
Knoxville Paper Box Co., 200-210 E. Magnolia Ave., Knoxville 1, Tenn.
•Kobi Polyethylene Bag Mfg. Co., Inc., 169 Franklin Ave., Brooklyn 5, N. Y.
Koch Convertograph Co., Inc., 1405 W. Missouri St., Evansville 7, Ind.
Koch, Harold, Co., 23 E. 26th St., New York 10, N. Y.
Koehler, Karl, Associates, Blue Church Road, Coopersburg, Pa.
Koehring Co., H-P-M Div., Marion Road, Mount Gilead, Ohio
Kogan, Belle, Associates, 145 E. 35th St., New York 16, N. Y.
Kohler Coating Machinery Corp., The, 9701 Cleveland Ave., N.W., Greentown, Ohio
Kohler, John B., & Associates, 103 E. Church St., Woodstock, Ill.
Kolar Laboratories, Inc., 1123 W. Jackson Blvd., Chicago 7, Ill.
Koller Craft Plastic Products, Inc., Fenton, Mo.
Kolmar Laboratories, Inc., Skyline Drive, Port Jervis, N. Y.
Koons, Irv, Associates, 8 E. 48th St., New York 17, N. Y.
Koopman-Neumer, 231 S. Green St., Chicago 7, Ill.
Koppel, E. Leonard, Associates, 284 Fifth Ave., New York 1, N. Y.
Koppel Photo Engraving Co., Inc., 1455 State St., New Haven 11, Conn.
•Koppers Co., Inc., 2500 Koppers Bldg., Pittsburgh 19, Pa.
Korda Associates, 20 W. 46th St., New York 36, N. Y.
•Kordite Co., Div. National Distillers & Chemical Corp., Macedon, N. Y.
Korn, Henry P., Co., 5 Beekman St., New York 38, N. Y.
Kornfeld, Herbert L., 1578 Crossroads of The World, Hollywood 28, Calif.
Koster, Louis, Associates, Freeport, Maine
Kraft Corrugated Containers, Inc., Constable Hook, Foot of E. 22nd St., Bayonne, N. J.
Kraft Paper Assn., Inc., 122 E. 42nd St., New York 17, N. Y.
Kraissl Co., Inc., The, 299 Williams Ave., Hackensack, N. J.
Krause, Frederick A., Associates, Inc., 3 Sixth St., Frenchtown, N. J.
Krause, Richard M., Inc., 52 E. 19th St., New York 3, N. Y.
Krengel Mfg. Co., Inc., 227 Fulton St., New York 7, N. Y.
Kresge Paper Box Co., Inc., 645 Main St., Bethlehem, Pa.
Kress, F. J., Box Co., 1—28th St., Pittsburgh 22, Pa.
Kroeck Paper Box Co., 1701 W. Superior St., Chicago 22, Ill.
Krone, Martin, Associates, 60 E. 42nd St., New York 17, N. Y.
Krylon, Inc., Ford & Washington Sts., Norristown, Pa.
Kupfer Bros. Co., 432 Park Ave. S., New York 16, N. Y.
Kurhan Co., Inc., 261 Fifth Ave., New York 16, N. Y.
Kusan, Inc., 3206 Belmont Blvd., Nashville 4, Tenn.
Kuss, R. L., & Co., Inc., Box 886, Findlay, Ohio
Kweller, Sam, 2301 W. Third St., Los Angeles 57, Calif.
Kwik Lok Corp., Box 2098, Yakima, Wash.

L

L. A. B. Corp., 980 Onondaga St., Skaneateles 3, N. Y.
L. M. Plastics Co., Inc., 306 N. Park, Lake Mills 1, Iowa
L. & M. Sales Co., 1414 S. Michigan Ave., Chicago 5, Ill.
L.O.F. Glass Fibers Co., 1810 Madison Ave., Toledo 1, Ohio
•La Cellophane, S.A., 110 Blvd. Haussmann, Paris, France
Label Manufacturers Assn., 1025 Connecticut Ave., N.W., Washington 6, D. C.
•Labelette Co., 216 S. Jefferson St., Chicago 6, Ill.
Labelon Corp., 10 Chapin St., Canandaigua, N. Y.
Label-Rite Co., Ltd., The, 21 Edgar Ave., Weston, Ont., Canada
Labels & Decals, Inc., 4880 W. Grand Ave., Chicago 39, Ill.
La Boiteaux Co., Inc., The, 2985 Madison Road, Cincinnati 9, Ohio
•Lachman-Novasel-Owens Paper Corp., 109 Greene St., New York 12, N. Y.
Lacollonge-Flexone, 24 Rue de Londres, Paris 9°, France
Lake Erie Engineering Corp., 869 Woodward Ave., Buffalo 17, N. Y.
Lake Industrial Products Co., 41 N. Main St., Chagrin Falls, Ohio
Lake-River Terminals, Inc., 5005 S. Harlem Ave., Berwyn, Ill.
•Lakso Co., Inc., The, 47 Ashby State Road, Fitchburg, Mass.
Lamarque, Abril, 207 E. 37th St., New York 16, N. Y.
Lamart Corp., 16 Richmond St., Clifton, N. J.
Lamb Glass Co., The, Mount Vernon, Ohio

Lambooy Label & Wrapper Co., 2129 Portage St., Kalamazoo 29F, Mich.
Lamex, Inc., Norcross, Ga.
Laminated Foil Manufacturers' Assn., 1002 Union Trust Bldg., Providence 3, R. I.
Laminated Paper Products, 1055 Martin St., Santa Clara, Calif.
Laminators, Inc., 243 Passaic St., Newark 4, N. J.
Lamson Corp., 499 Lamson St., Syracuse 1, N. Y.
Lancaster Paper Tube Mfg. Co., 834 Columbia Ave., Lancaster, Pa.
Landau Metal Products Corp., 2-62–51st Ave., Long Island City 1, N. Y.
Landell, Harper, & Associates, 1717 Sansom St., Philadelphia 3, Pa.
Landis, Ellis M., 100 S. Eagle Road, Havertown, Pa.
Landor, Walter, & Associates, Design Bldg., Pier 5 North, San Francisco 11, Calif.
Landowne, J., Co., Inc., 561 Grand Ave., Brooklyn 38, N. Y.
Landsberger Plastics Co., 550 Fifth Ave., New York 36, N. Y.
Lane-Bender, Inc., 157 W. 57th St., New York 19, N. Y.
Lange & Crist Box & Lumber Co., Inc., P.O. Box 2071, Clarksburg, W. Va.
Langston, Samuel M., Co., 1931 S. Sixth St., Camden 4, N. J.
Lansky Die Cutting Corp., 473 President St., Brooklyn 15, N. Y.
Lanzit Corrugated Box Co., 2445 S. Rockwell St., Chicago 8, Ill.
Lanzit Printing Co., 1051 S. Grand View St., Los Angeles 6, Calif.
Lapow, Harry, Associates, 250 W. 57th St., New York 19, N. Y.
Larido Corp., 381 Fourth Ave., New York 16, N. Y.
Larkin & Glassman Associates, 27 School St., Boston 8, Mass.
Larsen, Ben, 2421 W. 21st St., Minneapolis 5, Minn.
Larson Packaging Equipment Co., 3270 Ivanhoe Ave., St. Louis 39, Mo.
Lasalle Litho Corp., 52 E. 19th St., New York, N. Y.
•Lassiter, Div. Riegel Paper Corp., 350 Fifth Ave., New York 1, N. Y.
Latchford Package Co., 1849 N. Main St., Los Angeles 31, Calif.
Latham, Tyler, Jensen, 153 E. Huron St., Chicago 11, Ill.
Lathrop Paulson Co., 2459 W. 48th St., Chicago 32, Ill.
Laub Engineering Co., 244 N. San Marino, San Gabriel, Calif.
Laufer, Thomas, & Associates, 164 Spencer Ave., Sausalito, Calif.
Laurel Process Co., Inc., 601 W. 26th St., New York 1, N. Y.
LaWall & Harrisson Research Laboratories, 1921 Walnut St., Philadelphia 3, Pa.
Lawless Bros. Container Corp., 51 Robinson St., No. Tonawanda, N. Y.
Lawrence Packaging Supply Co., 859 Summer Ave., Newark 4, N. J.
Lawrence Paper Co., The, Sixth & New Hampshire Sts., Lawrence, Kan.
Lawrence Plastic Container Co., 4617 Regent St., Philadelphia 43, Pa.
Lawson Chemical Products Co., 17000 S. Broadway, Gardena, Calif.
•Lawson Co., The, Div. Miehle-Goss-Dexter, Inc., 2011 Hastings St., Chicago 8, Ill.
Lawson & Jones, Ltd., Wellington Road, London, Ont., Canada
Lawson & Lawson, Inc., 723 Seventh Ave., New York, N. Y.
Lawson Packaging Corp., 241 William St., Englewood, N. J.
Lawter Chemicals, Inc., 3550 Touhy Ave., Chicago 45, Ill.
Lea, David M., & Co., Inc., Hopkins Rd., Richmond 12, Va.
Lead Industries Assn., 292 Madison Ave., New York 17, N. Y.
Leal Corp., Oaklyn, N. J.
Lea-Tek Studio, Lake Zurich, Ill.
Leavitt, S. Taylor, Associates, Inc., 12 E. Grand Ave., Chicago 11, Ill.
•Lebanon Paper Box Mfg. Co., Tenth & Willow Sts., Lebanon, Pa.
Lechner Pulp & Paper Co., Inc., 1415 Queen Anne Road, Teaneck, N. J.
Lectromatic Devices, Inc., 3349 W. Addison St., Chicago 18, Ill.
Lectro-Treat Co., The, 5020 Eastern Ave., St. Louis 13, Mo.
•Lee Associates, 47A River St., Wellesley Hills 81, Mass.
Lee & Henry Mfg. Co., 441-5 Minna St., San Francisco 3, Calif.
Lee Machinery Corp., 28 W. 23rd St., New York 10, N. Y.
Lee Packaging Laboratories, Inc., 30 Main St., Brooklyn 1, N. Y.
Leedpak, Inc., 24 W. 58th St., New York 19, N. Y.
Leeds Paper Products, Inc., 24 Audubon Road, Leeds, Mass.
Lee-Hy Plastics, Inc., 160 Ellicott St., Buffalo 3, N. Y.
Leewood Corp., 900 Lawrence St., Lowell, Mass.
LeFan, C. H., Co., 4924 Greenville Ave., Dallas 6, Texas
Lehmann Printing & Lithographing Co., 300 Second St., San Francisco 7, Calif.
Leiman Bros., Inc., 146 Christie St., Newark 1, N. J.
Leland Machine Co., 60 E. 42nd St., New York, N. Y.
Lemay Machine Co., Inc., 276 Lemay Ferry Road, St. Louis 23, Mo.
Lemay Valve Co., 276 Lemay Ferry Road, St. Louis 23, Mo.
Lemberger Paper Box Corp., 341-7 Reid Ave., Brooklyn 33, N. Y.
Lembo Machine Works, Inc., 248 E. 17th St., Paterson 4, N. J.
Lemmon & Snoap, 2618 Thornwood, Grand Rapids 9, Mich.
Lengsfield Brothers, Inc., 1101 Tchoupitoulas St., New Orleans 6, La.
Lenk Co., The, Clair St., Franklin, Ky.
Leominster Paper Box Co., Inc., 43 Granite St., Leominster, Mass.
Lepak Co., Inc., The, 25-25 Borden Ave., Long Island City 1, N. Y.
•Lerner Plastics, Inc., 502 South Ave., Garwood, N. J.
Lerner Machine Co., Ltd., The, Lea Valley Road, Ponders End, Middlesex, England
Leshine Carton Co., Boston Post Road, Branford, Conn.
Lester-Phoenix, Inc., 2711 Church Ave., Cleveland 13, Ohio
Letts Box & Mfg. Co., Inc., 1802 S. Fourth, St. Joseph, Mo.
Lev-A-Lift Co., The, 277 Broadway, New York 7, N. Y.
•Lever Mfg. Co., Inc., 120 W. 31st St., New York 1, N. Y.
Levey, Fred'k. H., Co., Inc., 380 Madison Ave., New York 17, N. Y.
Levey, Harold A., Laboratories, 8127-33 Oleander St., New Orleans 18, La.
Levien, Jack R., P.O. Box 5353, Richmond, Va.
Levin, Monte L., 501 Madison Ave., New York 22, N. Y.
Levine, M. H., Co., Inc., 1141 Broadway, New York 1, N. Y.
Levine, Theodore R., & Sons, 86-90 Court St., Paterson 3, N. J.
Levis, John A., & Sons, Inc., 330 Lyell Ave., Rochester 6, N. Y.
Levy, J., 804 W. 180th St., New York 33, N. Y.
Lewis, G. B., Co., 452 Montgomery St., Watertown, Wis.
Lewis, Jerome, 306 Albemarle Road, Brooklyn 18, N. Y.
Lewis Paper Products Co., 2711 S. Throop St., Chicago 8, Ill.
Lewis-Shepard Products, Inc., 125 Walnut St., Watertown 72, Mass.
Lewis, Stephen J., Engineering Co., 215 Butler St., Brooklyn 18, N. Y.
Lewis Welding & Engineering Corp., 100 Northfield Road, Bedford, Ohio
Lewsyth Packaging Systems, 4420 Troost St., No. Hollywood, Calif.
Lewtan Co., The, 39 Hoadley Place, Hartford 1, Conn.
Lewy, Morris L., & Co., 350 Fifth Ave., New York 1, N. Y.
Libbie Printing Co., The, 465 Cambridge St., Allston 34, Mass.
Liberty Corrugated Container Corp., 47-40 Metropolitan Ave., Brooklyn 37, N. Y.
Liberty Cutting Die Co., 65 Bleecker St., New York, N. Y.
Liberty Engineering Co., P.O. Box 6, Beloit, Wis.
Liberty Glass Co., Collins Bldg., Sapulpa, Okla.
Liberty Laminates, 47-40 Metropolitan Ave., Brooklyn 37, N. Y.
Liberty Paper Box Co., 400 W. Third St., Winona, Minn.
Lid Printers, Inc., 1745 E. Slauson Ave., Los Angeles 58, Calif.
Liebs, L. A., Co., Inc., 312 E. 23rd St., New York 10, N. Y.
Lift Trucks, Inc., 2425 Spring Grove Ave., Cincinnati 14, Ohio
Lily-Tulip Cup Corp., 122 E. 42nd St., New York 17, N. Y.
Lincoln Molded Plastics, Inc., 13 Marshall St., So. Norwalk, Conn.
Lincoln Products, Inc., 85 Springdale Ave., Newark 7, N. J.
Linde Co., Div. Union Carbide Corp., 270 Park Ave., New York 17, N. Y.
Lindsay, John, 2475 W. 26th Ave., Denver 11, Colo.
Lindsey Can Co., Inc., 136 S. Maple Ave., So. San Francisco, Calif.
Lindstaedt Laboratories, 109 Fawn Drive, San Anselmo, Calif.
Linear Products, Inc., 37 W. 20th St., New York 11, N. Y.
Linehan & Co., 2062 Irving Blvd., Dallas 7, Texas
Linemaster Switch Corp., Woodstock, Conn.
Link-Belt Co., 1700 Prudential Plaza, Chicago 1, Ill.
Lion Packaging Products Co., Inc., 260 Duffy Ave., Hicksville, N. Y.
Lippincott & Margulies, Inc., 430 Park Ave., New York 22, N. Y.
Liquid Carbonic Corp., The, 3100 S. Kedzie Ave., Chicago 23, Ill.
Liquid Film Corp., 5140 N. 125th St., Butler, Wis.
Liquipak Corp., 211 Woodworth Ave., Alma, Mich.
Litho Can Div., R. M. Hollingshead Corp., Eighth & Cooper Sts., Camden, N. J.
Lithographers' Finishing Co., 635 W. 54th St., New York 19, N. Y.
Lithographers & Printers National Assn., Inc., 597 Fifth Ave., New York, N. Y.; 1025 Connecticut Ave., N.W., Washington 6, D. C.
Lithographic Technical Foundation, Inc., 131 E. 39th St., New York 16, N. Y.
Little, Arthur D., Inc., 25 Acorn Park, Cambridge, Mass.
Livingston & Co., Inc., 468 West Broadway, New York 12, N. Y.
Lockwood Grader Corp., Seventh & "S" Sts., Gering, Neb.

Lodes Aerosol Consultants, Inc., 730 Fifth Ave., New York 19, N. Y.
Loeb Equipment Supply Co., 824 W. Superior St., Chicago 22, Ill.
Loewy, Raymond, Associates, 425 Park Ave., New York 22, N. Y.
Logan Co., 201 Cabel St., Louisville 6, Ky.
Lok-Seal, Inc., 239 Park Ave. S., New York 3, N. Y.
Loma Industries, Inc., 300 W. Pafford St., Fort Worth 10, Texas
Lombard Governor Corp., Main St., Ashland, Mass.
Lone Star Plastics Co., Inc., 124 Roberts Cut Off, Fort Worth 16, Texas
Long, Bert, Contract Packers, 138 N. Mary St., Lancaster, Pa.
Long & Co., Inc., 1540 Barclay St., Baltimore 2, Md.
Long Island Engraving Co., 19 W. 21st St., New York 10, N. Y.
Long Island Finishing Corp., 5-39—48th Ave., Long Island City 1, N. Y.
Longview Fibre Co., P.O. Box 688, Longview, Wash.
Longyear, William, Pratt Institute, Brooklyn 5, N. Y.
Loomis Wadding Co., Inc., 1560 River St., Hyde Park, Mass.
Lord Baltimore Press, Inc., The, 425 Park Ave., New York 22, N. Y.
Lord Baltimore Press of California, The, 2701 Merced St., San Leandro, Calif.
Loroco Industries, Inc., 100 E. Benson St., Cincinnati 15, Ohio
Los Angeles Custom Packaging Co., 1734 N. Main St., Los Angeles 31, Calif.
Los Angeles Paper Box & Board Mills, 5959 E. Randolph St., Los Angeles 22, Calif.
Lotz, Abbott & Co., Ltd., 4 Vernon Place, Southampton Row, London, W.C.1, England
Louden, Lillian, 818 Olive St., St. Louis 1, Mo.
Louden Machinery Co., The, 607 W. Broadway, Fairfield, Iowa
Louisiana Plastics, Inc., 8229 Maryland Ave., St. Louis 5, Mo.
Louisville Cooperage Co., 421 W. Avery St., Louisville, Ky.
Louisville Pottery Co., 228 E. Bloom St., Louisville 8, Ky.
Lowe Paper Co., River St., Ridgefield, N. J.
Lowery & Schwartz, 527 W. 34th St., New York, N. Y.
Loy-Lange Box Co., 222 Russell Ave., St. Louis 4, Md.
Lucas, Mildred, 369 Lexington Ave., New York, N. Y.
Lucas Sales Co., 834 N.W. 34th St., Oklahoma City 18, Okla.
Lucid Containers, 41 Great Jones St., New York 12, N. Y.
•Ludlow Corp., 145 Rosemary St., Needham Heights 94, Mass.
Lumelite Corp., P.O. Box 25A, Pawling, N. Y.
Lurie & Lurie, 560 W. Washington, Chicago, Ill.
Lurie Plastics, Inc., 1913 Boulevard, Colonial Heights, Va.
•Lusteroid Container Co., Inc., 10 W. Parker Ave., Maplewood, N. J.
Lustour Corp., 10 S. Brentwood Blvd., St. Louis 5, Mo.
Lustra-Cite Industries, Inc., 331 Kent Ave., Brooklyn 1, N. Y.
Lustreprint Transparent Films, 932 Hertel Ave., Buffalo 16, N. Y.
Lutz & Sheinkman, 421 Hudson St., New York 14, N. Y.
Lyle, Edgar, Packaging Co., Inc., 61 Swarthmore St., Hamden 17, Conn.
•Lynch Corp., 2304 Crystal St., Anderson, Ind.
Lynn Box Co., 2650 Beaver St., Jacksonville, Fla.
Lyttleton Packaging Machinery Co., 2502 Dunlavy St., Houston 6, Texas

M

•M-D Blowers, Inc., Sub. Miehle-Goss-Dexter, Inc., 100 Fourth St., Racine, Wis.
M & D Flexographic Printers, Inc., 3600 W. 83rd Place, Chicago 52, Ill.
•MfP Div., Avery Industries, Inc., 333 N. Bayshore Blvd., San Mateo, Calif.
M-H Standard Corp., 515 Communipaw Ave., Jersey City 4, N. J.
M & Q Plastic Products, Bannard St., Freehold, N. J.
M & R Manufacturing Co., 608 Manchester Road, Mansfield, Ohio
M. R. Plastics Research, Inc., 290 Rochester St., Salamanca, N. Y.
•MRM Co., Inc., Bethpage Parkway, Plainview, N. Y.
Maas & Waldstein Co., 2121 McCarter Hwy., Newark 4, N. J.
Mac Sim Bar Paper Products Co., 431 Helen Ave., Otsego, Mich.
MacAndrews & Forbes Co., 200 Fifth Ave., New York 10, N. Y.
Macbeth Daylighting Corp., P.O. Box 950, Newburgh, N. Y.
MacDonald Mfg. Co., 600 Green St., New Baltimore, Mich.
Macey, Avery, International Corp., 420 Lexington Ave., New York 17, N. Y.
Macey Co., 13835 Enterprise Ave., Cleveland 35, Ohio
Machine-O-Matic, Inc., 717 Chicago Ave., Evanston, Ill.
Machinery Electrification, Inc., 56 Hudson St., Northboro, Mass.
Machinery & Products Engineering Co., 3630 Frankford Ave., Philadelphia 34, Pa.
Machinery Service Co., Inc., 214 Eiler Ave., Louisville 14, Ky.
Mack Molding Co., Ryerson Ave., Wayne, N. J.
Mackay, Thos. W., & Son Ltd., 1807 Fir St., Vancouver 9, B. C., Canada
Madan Plastics, Inc., 370 North Ave., Cranford, N. J.
Madison Glue Corp., 200 W. 34th St., New York 1, N. Y.
Magers, Charles, P.O. Box 495, Princeton, N. J.
Magic City Bottle & Supply, 6250 N.W. 35th Ave., Miami 47, Fla.
Magid-Robinson Co., Inc., 43 W. 16th St., New York 11, N. Y.
Magill, D. G., 15 Tulip Drive, Great Neck, N. Y.
Magill-Weinsheimer Co., 4545 W. Touhy Ave., Chicago 46, Ill.
Magline, Inc., 1957 Mercer St., Pinconning, Mich.
Magnat Machinery & Pattern Corp., Leeds, Mass.
Maguire, J. P., Co., 3144 Paris Ave., New Orleans 19, La.
Mahaffy Engineering Co., 25 Amity St., Little Falls, N. J.
Maharam Fabric Corp., 130 W. 46th St., New York 36, N. Y.
Mahon, Thomas J., Inc., Englewood Cliffs, N. J.
Main Brothers Box & Lumber Co., Karnak, Ill.
Main, Chas. T., Inc., 80 Federal St., Boston 10, Mass.
•Main, Robert A., & Sons, Inc., 465 W. Main St., Wyckoff, N. J.
Maine Machine Works, 1230 E. 109th St., Los Angeles 59, Calif.
Maine Paper Tube Corp., Box 177, Gardiner, Maine
Maine Potato Bag Co., Broadway, Caribou, Maine
Majestic Creations, Inc., 37-03 Woodside Ave., Woodside 77, N. Y.
Major Packaging, Inc., 518 Factory Road, Addison, Ill.
Malanco, Inc., 2200 W. 138th St., Blue Island, Ill.
Mamco Corp., 532-542 Fourth St., Racine, Wis.
Manchester Board & Paper Co., 1850 Ninth St. Rd., Richmond 24, Va.
Manchester Boxes, Ltd., 100 Sterling Road, Toronto, Ont., Canada
Mancib, Alvin S., Co., 363 Walden St., Cambridge 38, Mass.
Maness Manufacturing Co., Bryson City, N. C.
Manfredi Machinery Corp., 28 Adelphi St., Brooklyn, N. Y.
•Manhasset Machine Co., Inc., 409 Bayview Ave., Amityville, N. Y.
Manhattan Adhesives Corp., 425 Greenpoint Ave., Brooklyn 22, N. Y.
Manion Steel Barrel Co., Oil City, Pa.
Mankato Paper Box Co., 1301 Third Ave. N., Mankato, Minn.
Mankato Plastic Co., 1303 Third Ave., Mankato, Minn.
Mansfield Paper Box & Novelty Co., 184 Brooker Place, Mansfield, Ohio
Mantes, T. R., Co., 489 Sixth St., San Francisco 3, Calif.
Mantrose Corp., The, 99 Park Ave., New York 16, N. Y.
Manufacturers Aid Co., 721 Grand St., Hoboken, N. J.
Manufacturers Box Co., Inc., The, 305 Railroad Ave., Bridgeport 4, Conn.
Manufacturers Engineering & Equipment Corp., York Road & Sunset Lane, Hatboro, Pa.
Manufacturing Chemists' Assn., Inc., 1825 Connecticut Ave., N.W., Washington 9, D. C.
Marac Machinery Corp., 45 S. Broadway, Yonkers, N. Y.
•Marathon, Div. American Can Co., Menasha, Wis.
Marathon Box Co., Box 929, Wausau, Wis.
Marathon Packages Ltd., 100 Sterling Road, Toronto, Ont., Canada
Marbek, Inc., 1200 Manhattan Ave., Brooklyn 22, N. Y.
Marblette Corp., The, 37-31—30th St., Long Island City 1, N. Y.
Marcy Laboratories, 2161 N. California Ave., Chicago 47, Ill.
Mardon, Son & Hall, Ltd., Caxton Works, Temple Gate, Bristol 1, England
Mareen Co., 356 Winona St., Park Forest, Ill.
Marinette & Menominee Box Co., 111 Hosmer St., Marinette, Wis.
Marion Paper Box Co., 600 E. 18th St., Marion, Ind.
Mark Specialty Co., 183 St. Paul St., Rochester 4, N. Y.
Markandy, Inc., 145 Grand Ave., St. Louis 22, Mo.
Markel Co., Sub. Morris L. Lewy & Co., 350 Fifth Ave., New York 1, N. Y.
•Markem Machine Co., 150 Congress St., Keene 11, N. H.
Marken Plastic Corp., 2250 E. 111th St., Los Angeles 59, Calif.
Market Forge Co., 35 Garvey St., Everett 49, Mass.
Marketing Devices, Inc., 1170 Broadway, New York 1, N. Y.
Marking Device Assn., 912 Chicago Ave., Evanston, Ill.
Marking Products Ltd., 1801 Favard St., Montreal 22, Que., Canada
Markley, Margery, 343 E. 30th St., New York 16, N. Y.
Marks, Edward M., Co., 960 E. 61st St., Los Angeles 1, Calif.

Marohn, Lane, 180 Riverside Drive, New York 24, N. Y.
Marquardt & Co., Inc., 155 Spring St., New York 12, N. Y.
Marquardt Corp., 1500 S. Western Ave., Chicago 8, Ill.
Marsh Stencil Machine Co., 707 East B St., Belleville, Ill.
Marshall Paper Tube Co., Marshall St., Randolph, Mass.
Marshville Box Co., U.S. Hwy. 74 West, Marshville, N. C.
Martex Co., Inc., 18 W. Landis Ave., Vineland, N. J.
Martin, Andrew M., Co., Westerly Road, Ossining, N. Y.
Martin Brothers Container & Timber Products Corp., The, 39 Blucher St., Toledo 1, Ohio
Martin Engineering Co., U. S. Route #34, Neponset, Ill.
Martin, Fair, Boxes, Inc., Wilshire Drive, Concord, N. C.
Martin & Martin, 122 W. Kinzie St., Chicago 10, Ill.
Martin Paper Box Mfg. Corp., 346 Carroll St., Brooklyn 31, N. Y.
Martindell Molding Co., N. Olden & Sixth St., Trenton 8, N. J.
Martinelli, A. C.,-Rogers Plastic Corp., West Warren, Mass.
Marvell Pharmacal Co., 55 W. 16th St., New York 11, N. Y.
Marvellum Co., The, 28 Appleton St., Holyoke, Mass.
Maryland Glass Corp., 2147-53 Wicomico St., Baltimore 30, Md.
Maryland Paper Box Co., The, Leadenhall & Ostend Sts., Baltimore 30, Md.
Maryland Plastics, Inc., Federalsburg, Md.
Mason Box Co., The, 521 Mt. Hope St., Attleboro Falls, Mass.
Mason, F. E., & Sons, 100 Franklin St., Batavia, N. Y.
Mason Transparent Package Co., Div. Mason Envelope Co., Inc., 1180-88 Commerce Ave., New York 62, N. Y.
Mason-Keller Corp., Harrison Ave., Roseland, N. J.
Massachusetts Plastic Corp., Ludlow, Mass.
Massillon Container Co., 49 Ohio St., Navarre, Ohio
Masta Displays, Inc., 230 W. 17th St., New York 11, N. Y.
Master Addresser Co., 6500 W. Lake St., Minneapolis 26, Minn.
Master Appliance Mfg. Co., Fourth & Ontario Sts., Racine, Wis.
Master Package Corp., The, P.O. Box 366, Owen, Wis.
Master Packaging, Inc., 6932 S. Manhattan, Tampa 11, Fla.
Master Paper Box Co., Inc., 1319 S. Michigan Ave., Chicago 5, Ill.
Master Plastic Molding Corp., 1216 S. Vandeventer St., St. Louis 10, Mo.
Master-Kraft Fixture Co., The, 2320 Lipps Lane, Baltimore 23, Md.
Mateer, G. Diehl, Co., 776 W. Lincoln Hwy., Wayne, Pa.
Mathews Conveyor Co., Tenth St., Ellwood City 1, Pa.
Mathews Paperbox Co., 5041 San Fernando Road, Los Angeles 39, Calif.
Matthews, Jas. H., & Co., 3942 Forbes Ave., Pittsburgh 13, Pa.
•Matthias Paper Corp., 165 W. Berks St., Philadelphia 22, Pa.
Maurer, Sascha, Gaylordsville, Conn.
Mautner Co., Inc., The, 580 Fifth Ave., New York 36, N. Y.
Maxson Automatic Machinery Co., 98 Granite St., Westerly, R. I.
Maxwell Brothers, Inc., 1037 E. 87th St., Chicago 19, Ill.
May, Alfred M., Co., 1519 Central Pkwy., Cincinnati 14, Ohio
May Tag & Label Corp., 111 W. 19th St., New York 11, N. Y.
Mayer, A. G., Inc., 203 E. 18th St., New York 3, N. Y.
Mayer, Frank, & Associates, Inc., 4727 N. Teutonia Ave., Milwaukee 9, Wis.
Mayflower Electronic Devices, Inc., 20 Industrial Ave., Little Ferry, N. J.
Mayhew, J. H., Co., The, 340 Highway #7, Excelsior, Minn.
Mayland Co., The, 236 W. 27th St., New York 1, N. Y.
Maywood Glass Co., 4855 E. 52nd Place, Los Angeles 22, Calif.
McCambridge Packaging Equipment Co., 4845 N. Paulina St., Chicago 40, Ill.
McCandlish Lithograph Corp., Roberts Ave. & Stokley St., Philadelphia 29, Pa.
McClintock Corp., The, 601 W. 26th St., New York 1, N. Y.
McClintock Mfg. Co., Div. Ekco Products, 802 W. Whittier Blvd., Whittier, Calif.
McCowat-Mercer Press, Inc., 202 Riverside St., Jackson, Tenn.
McCoy Label Co., Inc., 608 Commercial St., San Francisco 11, Calif.
McCoy Paper Converters, Inc., Third & Huntingdon Sts., Philadelphia 33, Pa.
McCutcheon Bros. & Quality, Inc., 2653 N. Reese St., Philadelphia 33, Pa.
McDonald Printing Co., Inc., Arbor Place, Cincinnati 8, Ohio
McDougall Control Co., 520 First Ave., S., Seattle 4, Wash.
McGill Co., 501 Park Ave., Minneapolis 15, Minn.
McGuire Chemical Co., P.O. Box 98, Oakland 4, Calif.
McKay Chemical Co., Inc., 880 Pacific St., Brooklyn 38, N. Y.
McKay-Davis Chemical Corp., 328 N. Westwood Ave., Toledo, Ohio
McKenzie Service, Inc., 95 Morton St., New York, N. Y.
McMackin, Hugh J., Co., 240 Milk St., Boston 9, Mass.
McShea, William T., Co., 16 E. 12th St., New York 3, N. Y.
Mead Corp., The
General Offices, 118 W. First St., Dayton 2, Ohio
Mead Board Sales, Inc., Sub., 3347 Madison Road, Cincinnati 9, Ohio
Mead Containers, Div., 4927 Beech St., Cincinnati 12, Ohio
Mead Packaging, Div., 950 W. Marietta St., N.W., Atlanta 2, Ga.
Mead Packaging, Div., Liquid-Tight Container Plant, 240 Canal St., Lawrence, Mass.
Mead Papers, Inc., Sub., 118 W. First St., Dayton 2, Ohio
Mealey, R. J., Corp., 51 States St., San Francisco 14, Calif.
Mearl Corp., The, 41 E. 42nd St., New York 17, N. Y.
Mecca Machinery Co., 22-70—45th St., Long Island City 5, N. Y.
Mechanical Handling Systems, Inc., 4600 Nancy Ave., Detroit 12, Mich.
Meehan, J. E., Co., 1970 Berkeley Road, Highland Park, Ill.
Meehan Tooker Co., Inc., The, 170 Varick St., New York 13, N. Y.
•Mehl Mfg. Co., 2057 Reading Road, Cincinnati 2, Ohio
Meisel Press Mfg. Co., 944 Dorchester Ave., Boston 25, Mass.
Melco Wire Products, Inc., 4420 San Fernando Road, Glendale 4, Calif.
Mele Mfg. Co., 366 Fifth Ave., New York 1, N. Y.
Mele Packaging Corp., 1712 Erie St., Utica, N. Y.
Melind, Louis, Co., 3524 N. Clark St., Chicago 13, Ill.
Melker, A. R., Co., 110 E. 42nd St., New York 17, N. Y.
Melrose Packaging Corp., 61-48 Fresh Meadow Lane, Flushing 65, N. Y.
Melrose Wire Products, Inc., 150 Dayton Ave., Passaic, N. J.
Menasha Container of Calif., 601 E. Ball Road, Anaheim, Calif.
Mendola Bros., Inc., 1305 Decatur St., New Orleans 16, La.
Mengel Co., The, Corrugated Box Div., Louisville 1, Ky.
Mercer Paper Tube, Inc., 650 W. Ingham Ave., Trenton 5, N. J.
Merchandiser Press, Inc., 127 Seventh Ave., New York 11, N. Y.
Merchants Box Co., Dallastown, Pa.
Merchants Chemical Co., The, 60 East 42nd St., New York 17, N. Y.
•Mercury Engineering Corp., Sub. Miehle-Goss-Dexter, Inc., 2100 N. Farwell Ave., Milwaukee 2, Wis.
•Mercury Heat Sealing Equipment Co., 2601-21 N. Howard St., Philadelphia 34, Pa.
Mercury Industries, Inc., 365 Broadway, Hillsdale, N. J.
Mercury Mfg. Co., 4710 W. Division St., Chicago 51, Ill.
Merendino/Greene & Associates, Inc., 476 S. Pasadena Ave., Pasadena, Calif.
Merit Container Corp., 799 Washington St., New York 14, N. Y.
Merit Displays Co., McLean Blvd. at E. 26th St., Paterson 4, N. J.
Merit Packaging & Equipment Corp., 193 Elm Place, Mineola, N. Y.
Merix Chemical Co., 2234 E. 75th St., Chicago 49, Ill.
Merlon Paper Converting & Finishing Corp., 621 E. 216th St., New York 67, N. Y.
Merrick Transparent Container Co., 95-30—150th St., Jamaica 4, N. Y.
Merrill Machinery Co., 1225 W. Belmont Ave., Chicago 13, Ill.
Metal Box Co., Ltd., 37 Baker St., London, W.1, England
•Metal Closures Ltd., Bromford Lane, West Bromwich, Staffs., England
•Metal Div., Continental Can Co., Inc., 633 Third Ave., New York 17, N. Y.
Metal Edge Industries, 170 Gloucester Road, Barrington, N. J.
Metal Fabrications, Inc., 205 Cherry St., Waterbury, Conn.
Metal Film Co., 40 Worth St., New York, N. Y.
Metaline Products Co., Inc., 101 N. Feltus St., So. Amboy, N. J.
Metalite, Inc., 381 E. Main St., Meriden, Conn.
Metallic Plastics Corp., 27-10—44th Drive, Long Island City 1, N. Y.
Metals Disintegrating Co., Div. American-Marietta Co., Box 290, Elizabeth, N. J.
Metric Products Co., 11800 Bannister Road, Kansas City 33, Mo.
Metro Corrugated Containers, Inc., 62-69 Fresh Pond Road, Ridgewood 27, N. Y.
•Metro Glass, Div. National Dairy Products Corp., 107 West Side Ave., Jersey City 5, N. J.
Metropolitan Envelope Service, 42 E. 23rd St., New York 10, N. Y.
Metropolitan Plastics Corp., 865 Grand St., Brooklyn 11, N. Y.
Metropolitan Watch Material Importing Co., 200 W. 72nd St., New York, N. Y.
Mettler Instrument Corp., P.O. Box 100, Princeton, N. J.
Metzgar Conveyor Co., 412 Douglas St. N.W., Grand Rapids 4, Mich.
Metzig, William, 331 Madison Ave., New York 17, N. Y.
Meyer, Geo. J., Mfg. Co., Dumore Ct., Cudahy, Wis.

Meyercord Co., The, 5323 W. Lake St., Chicago 44, Ill.
Miami Paper Board Mills, Inc., N.W. 28th St. & LeJeune Rd., Miami 48, Fla.
Miami Valley Coated Paper Co., The, Oxford Road, Franklin, Ohio
Michigan Carton Co., 79 E. Fountain St., Battle Creek, Mich.
Michigan Collapsible Tube Co., 23150 Schoenherr Road, Warren, Mich.
Michigan Industrial Packaging, Inc., 4120 Eastern Ave., S.E., Grand Rapids 8, Mich.
Michigan Lithographing Co., 1 Carlton Ave., S.E., Grand Rapids 6, Mich.
Micro Switch, Div. Minneapolis-Honeywell Regulator Co., Chicago & Spring Sts., Freeport, Ill.
Microfibres, Inc., 1 Moshassuck St., Pawtucket, R. I.
Micron Plastics Corp., 640 Dean St., Brooklyn 38, N. Y.
Middle West Display & Sales Co., 517 W. Monroe St., Chicago, Ill.
Middlesex Paper Tube Co., Inc., 345 Chelmsford St., Lowell, Mass.
Middlesex Products Corp., 111 Putnam Ave., Cambridge 39, Mass.
Midland Adhesive & Chemical Corp., 2600 Goodrich St., Ferndale 20, Mich.
Midland Container Corp., 827 Koeln Ave., St. Louis 11, Mo.
•Midnight Engineering Co., 701 S. LaSalle St., Chicago 5, Ill.
Mid-States Gummed Paper Div., Minnesota Mining & Mfg. Co., 6850 S. Harlem Ave., Bedford Park, Ill.
Mid-States Rubber Products, Inc., 1230 Race St., Princeton, Ind.
Mid-States Steel & Wire Co., 510 S. Oak St., Crawfordsville, Ind.
Midway Machine Co., 2324 University Ave., St. Paul 14, Minn.
Midwest Molding & Mfg. Co., Gurnee, Ill.
Mid-West-Pak Corp., 801 Fifth Ave., Belvidere, Ill.
Midwest Plastic Products Co., 1801 Chicago Road, Chicago Heights, Ill.
Midwest Testing Laboratories, 510 N. Dearborn St., Chicago 10, Ill.
Mid-West Wax Paper Co., 1109 Ave. I, Fort Madison, Iowa
Mid-York Press, Inc., The, 37 Milford St., Hamilton, N. Y.
•Miehle-Goss-Dexter, Inc.
General Offices, 2011 Hastings St., Chicago 8, Ill.
•Dexter Co., The, Div., 2011 Hastings St., Chicago 8, Ill.
Goss Printing Press Co., Div., 5601 W. 31st St., Chicago 50, Ill.
•Lawson Co., The, Div., 2011 Hastings St., Chicago 8, Ill.
•M-D Blowers, Inc., Sub., 100 Fourth St., Racine, Wis.
•Mercury Engineering Corp., Sub., 2100 N. Farwell Ave., Milwaukee 2, Wis.
•Miehle Co., The, Div., 2011 Hastings St., Chicago 8, Ill.
•Miehle Co., The, Div. Miehle-Goss-Dexter, Inc., 2011 Hastings St., Chicago 8, Ill.
Mil-Jan Bag Co., 220 Monroe Ave., Muskegon, Mich.
Milk Bottle Crate Mfrs. Council, Keith Bldg., Cleveland 15, Ohio
Milk Carton Quality Preforming Council, 510 N. Dearborn St., Chicago 10, Ill.
Millar, Geo. W., & Co., Inc., 284 Lafayette St., New York 12, N. Y.
Miller Box Co., P.O. Box 205, Tuscaloosa, Ala.
Miller Cardboard Corp., 80 Wooster St., New York 12, N. Y.
Miller, F. E., Assoc., 1070 Forest Drive, Columbus 23, Ohio
Miller Hydro Co., Bainbridge, Ga.
Miller Label Co., 4006 Pacific Ave., Tacoma 1, Wash.
Miller Mfg. Co., Inc., Seventh & Stockton Sts., Richmond, Va.
Miller & Miller, Inc., Sub. Union Bag-Camp Paper Corp., P.O. Box 865, Atlanta 1, Ga.
Miller Printing Machinery Co., 1101-1131 Reedsdale St., Pittsburgh 33, Pa.
Miller, T. R., Mill Co., Inc., Deer St., Brewton, Ala.
Miller, Tompkins & Co., 513 Paterson Ave., E. Rutherford, N. J.
Miller & Van Winkle Co., Polystyrene Machinery Div., 155 Sherman St., Paterson, N. J.
Miller, Walter P., Co., Inc., 452 York Ave., Philadelphia 23, Pa.
Miller Wrapping & Sealing Machine Co., 18 S. Clinton St., Chicago 6, Ill.
Miller-Lenfesty Supply Co., 1104 Twiggs St., Tampa 1, Fla.
Miller-Robinson Co., 7007 Avalon St., Los Angeles 3, Calif.
Millhiser Sales Corp., 612 State St., Richmond 8, Va.
Mills, H. J., Inc., 149 Church St., Bristol, Conn.
Millville Lumber Products, Inc., Millville, Pa.
Milpaco, Inc., 1073 N. Clinton Ave., Rochester 21, N. Y.
•Milprint, Inc., 4200 N. Holton St., Milwaukee 1, Wis.
Milton, George A., Can Co., Inc., 131 N. 14th St., Brooklyn 11, N. Y.
Milwaukee Label & Seal Co., 928 N. Jefferson St., Milwaukee 2, Wis.
Milwaukee Printed String Co., 2604 W. Fond du Lac Ave., Milwaukee 6, Wis.
Milwaukee Tool & Machine Co., 524 S. Second St., Milwaukee 4, Wis.
Minco Products Corp., 69 Washington St., Brooklyn 1, N. Y.
Minden Paper Gauge Co., Inc., 230 W. 41st St., New York 36, N. Y.
Minerva Wax Paper Co., Grant Blvd., Minerva, Ohio
Minkow Sales & Service Corp., 741 E. Ninth St., New York 9, N. Y.
Minneapolis-Honeywell Regulator Co., 2753 Fourth Ave. S., Minneapolis 8, Minn.
Minneapolis Sewing Machine Co., Inc., 4865 N. Osseo Road, Minneapolis 12, Minn.
Minnesota Filler Co., 829 S.E. Ninth St., Minneapolis 14, Minn.
Minnesota Mining & Mfg. Co.
General Offices, 900 Bush Ave., St. Paul 6, Minn.
Derby Sealers Div., P. O. Box 550, Derby, Conn.
Hartford City Paper Div., 900 Bush Ave., St. Paul, Minn.
Mid-States Gummed Paper Div., 6850 S. Harlem Ave., Bedford Park, Ill.
Minnesota & Ontario Paper Co., 500 Investors Bldg., Minneapolis 2, Minn.
Minot Folding Box Co., Inc., 82 Gerard St., Boston 19, Mass.
Mirro Aluminum Co., 1512 Washington St., Manitowoc, Wis.
Mirro-Products Co., Tate St., High Point 2, N. C.
Miskella Infra-Red Co., The, E. 73rd & Grand Ave., Cleveland 4, Ohio
•Missisquoi Specialty Board Div., Standard Packaging Corp., Sheldon Springs, Vt.
Mitcham Cardboards Ltd., 95-99 Beddington Lane, Croyden, Surrey, England
Mitchell-Hopper Assoc., 468 Jackson St., San Francisco 11, Calif.
Mitchell Molders, 639 N. Addison Road, Villa Park, Ill.
Mitchell Paper Products Co., 350 Hoover Ave., Bloomfield, N. J.
•Mitsui & Co., Ltd., P.O. Box 822, Tokyo Central, Tokyo, Japan
Mobay Chemical Co., Penn Lincoln Pkwy. W., Pittsburgh 5, Pa.
Mobile Projects Corp., 2265 S. Albion, Denver 22, Colo.
Mobilift Co., Div. Minneapolis-Moline Co., 130 Ninth Ave., S., Hopkins, Minn.
Model Printing Equipment Corp., 511 Madison St., Hoboken, N. J.
Modern Art Printing Co., Inc., 34-36–56th St., Woodside 77, N. Y.
Modern Boxes, Inc., 4949 N. Pulaski Road, Chicago 30, Ill.
Modern Color Process Co., Inc., 693 Portland Ave., Rochester 21, N. Y.
Modern Decorating Co., 155 Oxford St., Paterson, N. J.
Modern Engraving & Machine Co., 1413 Chestnut Ave., Hillside 5, N. J.
Modern Folding Carton Corp., 102 Kane St., Brooklyn 31, N. Y.
•Modern Packages Div., Standard Packaging Corp., 4500 E. Dunham St., Los Angeles, Calif.
Modern Packaging, Inc., Shreve St., Mt. Holly, N. J.
Modern Packaging Machinery Co., 14950 Delano St., Van Nuys, Calif.
Modern Paper Box Mfg. Co., 1147 N. Fourth St., Philadelphia, Pa.
•Modern Plastic Machinery Corp., 64 Lakeview Ave., Clifton, N. J.
Modern Plastics Corp., 489 N. Shore Drive, Benton Harbor, Mich.
Modern Transparent Mfg. Co., Inc., 530 Exeter Ave., West Pittston, Pa.
Modern-Miltex Corp., 270 E. 134th St., New York 54, N. Y.
Mohawk Containers, Inc., Campion Road, New Hartford, N. Y.
Mohlman, G. A., 110 Washington Place, New York 14, N. Y.
•Mojonnier, Albert, Inc., 9151 Fullerton Ave., Franklin Park, Ill.
Mold-Craft, Inc., 100 N. Lake St., Port Washington, Wis.
Molded Insulation Co., 335 E. Price St., Philadelphia 44, Pa.
Molins Machine Co., Inc., 1716 Summit Ave., Richmond 30, Va.
Monaplastics, Inc., Route 7, Georgetown, Conn.
•Monarch Marking System Co., The, 216 S. Torrence St., Dayton 29, Ohio
Monarch Plastic Products Co., 1801 N. Marshall St., Milwaukee, Wis.
Monmouth Container Corp., The, Harrison Ave., Matawan, N. J.
Monogram of California, 2500–18th St., San Francisco 10, Calif.
Monomelt Co., Inc., The, 1611 Polk St., N.E., Minneapolis 13, Minn.
•Mono-Sol Corp., 407 County Line Road, Gary, Ind.
Monroe Paper Boxes, 601 W. 26th St., New York 1, N. Y.
Monroe-Danford & Co., 974 Boulevard East, Weehawken, N. J.
Monsanto Chemical Co., 800 N. Lindbergh Blvd., St. Louis 66, Mo.
Monsanto Chemical Co., Plastics Div., Springfield 2, Mass.
Montecatini, Largo Guido Donegani, 1-2, Milano, Italy
Moonglow Plastic Jewel Corp., 230 Fifth Ave., New York 1, N. Y.
Moore, George Arlington, 230 E. 48th St., New York 17, N. Y.
Moore, Kenneth J., & Co., 1778 W. Estes Ave., Chicago 26, Ill.
Moore & Munger, 33 Rector St., New York 6, N. Y.

Moraine Box Co., P.O. Box 1018, Dayton 1, Ohio
Moravec, L. A., 23017 Canzonet St., Woodland Hills, Calif.
Morgan Adhesives Co., 4560 Darrow Road, Stow, Ohio
Morgan Bros. Bag Co., Inc., Belleville & Moore Sts., Richmond, Va.
Morgan Fairest Ltd., Carlisle St., Sheffield 4, Yorkshire, England
Morgan Laminating & Foliating Co., 333 Sixth Ave., New York 14, N. Y.
Morgan Lumber Sales Co., 665 E. Broad St., Columbus 4, Ohio
Morningstar Corp., The, 205 Broadway, Cambridge 39, Mass.
•Morningstar-Paisley, Inc., 630 W. 51st St., New York 19, N. Y.
Morrill Press, The, 215 Cayuga St., Fulton, N. Y.
Morse Decals, 1213 E. 14th St., Los Angeles 21, Calif.
Moser Bag & Paper Co., The, 3049 E. 55th St., Cleveland 27, Ohio
Mosinee Paper Mills Co., Mosinee, Wis.
Moskowitz, Jack, 299 Madison Ave., New York 17, N. Y.
Moskowitz, L. R., & Associates, 3068 W. 25th St., Erie, Pa.
Moslo Machinery Co., 2443 Prospect Ave., Cleveland 15, Ohio
Mosstype Corp., 150 Franklin Turnpike, Waldwick, N. J.
Motec Industries, Inc., 130 Ninth Ave. S., Hopkins, Minn.
Moto-Truc Co., The, 1953 E. 59th St., Cleveland 3, Ohio
Motson, J. Frank, Co., 1717 Bethlehem Pike, Flourtown, Pa.
Mott Carton Co., 2226 Eugenia St., St. Louis 3, Mo.
Motter's, George F., Sons, 132 S. Pershing Ave., York, Pa.
Mount Joy Paper Box Co., Inc., 292 W. Main St., Mount Joy, Pa.
Mountain Waterproof Papers, Inc., 10 Kansas St., Worcester 10, Mass.
Mousley, Geo. E., Inc., Quidnick St., West Warwick, R. I.
Muirson Label Co., Inc., 435 Stockton Ave., San Jose 26, Calif.
Mullen Container Corp., 1020 Rush St., Chicago 11, Ill.
Mullery Paper Packages, Inc., 1050 Kent St., St. Paul 17, Minn.
Mulligan, James, Printing Co., 1808 Washington Ave., St. Louis 3, Mo.
Multi Carton Co., Inc., 187 Liberty St., Springfield, Mass.
Multicolor Gravure Corp., 29 N. Maple St., Florence, Mass.
Multi-Colortype Co., The, 4575 Eastern Ave., Cincinnati 26, Ohio
Multifold, Inc., 750 Main St., Milford, Ohio
Multi-Pak Corp., 8446 San Fernando Rd., Sun Valley, Calif.
Multistamp Co., The, 527 W. 21st St., Norfolk 17, Va.
Multiwall Bag Sales Div., Crown Zellerbach Corp., 1 Bush St., San Francisco, Calif.
Mundet Cork Corp., 7101 Tonnelle Ave., No. Bergen, N. J.
Munray Products Div., The Fanner Mfg. Co., 12400 Crossburn Ave., Cleveland 35, Ohio
Munson Bag Co., The, 1366 W. 117th St., Cleveland 7, Ohio
Murnane Paper Co., 607 Northwest Ave., Northlake, Ill.
Muro Plastics Co., P.O. Box 7325, Seattle, Wash.
Murray Glass, Inc., 472 Mulberry St., Newark 5, N. J.
Muskegon Marking Equipment Co., Packaging Supplies Div., 1147 Third St., Muskegon, Mich.
Muskegon Paper Box Co., 997 W. Western Ave., Muskegon, Mich.
Mutual Box Board Co., 1532 Erie St., Utica, N. Y.
Mutual Paper Box Corp., 1500 W. Harrison St., Chicago 7, Ill.
Mutual Plastic Mold Corp., 5141 Firestone Place, South Gate, Calif.
Myron Manufacturing Corp., 214 Lafayette Pl., Englewood, N. J.
Mystik Adhesive Products, Inc., 2635 N. Kildare Ave., Chicago 39, Ill.

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Nakai Shoten, Ltd., 4, 3-chome, Muromachi, Nihonbashi, Chuo-ku, Tokyo, Japan
Nalbach, John R., Engineering Co., Inc., 6139 W. Ogden Ave., Chicago 50, Ill.
Nalco Chemical Co., 6216 W. 66th Pl., Chicago 38, Ill.
Nalle Plastics, Inc., 108-12 W. Second St., Austin 1, Texas
Namco Machinery, Inc., 54 Kosciusko St., Brooklyn 5, N. Y.
Nappe-Smith Mfg. Corp., Southard Ave., Farmingdale, N. J.
Narragansett Coated Paper Corp., 730 York Ave., Pawtucket, R. I.
•Nash, J. M., Co., Inc., 123 Jackson St., Oshkosh, Wis.
Nash, Jim, Associates, Inc., 527 Madison Ave., New York 22, N. Y.
Nash-Hammond, Inc., 10141 E. Rush St., El Monte, Calif.
•Nashua Corp., 44 Franklin St., Nashua, N. H.
Nashua Paper Box Co., 2 Dearborn St., Nashua, N. H.
National Assn. of Frozen Food Packers, 919—18th St., N.W., Washington 6, D.C.
National Assn. of Glue Manufacturers, Inc., 55 W. 42nd St., New York 36, N. Y.
National Assn. of Printing Ink Makers, Inc., 1440 Broadway, New York 23, N. Y.
National Assn. of Sanitary Milk Bottle Closure Mfrs., 1532 Philadelphia National Bank Bldg., Philadelphia 7, Pa.
National Automatic Tool Co., S. Seventh & N Sts., Richmond, Ind.
National Barrel & Drum Assn., Inc., 1343 L St., N.W., Washington 5, D. C.
National Bundle Tyer Co., 320 W. Adrian St., Blissfield, Mich.
•National Can Corp., 3217 W. 47th Place, Chicago 32, Ill.
National Canners Assn., 1133—20th St., N.W., Washington 6, D. C.
National Carton Corp., 1 Park Road, Joliet, Ill.
National Casein Co., 601 W. 80th St., Chicago 20, Ill.
National Cleanser Products Co., Inc., 437 Eleventh Ave., New York 18, N. Y.
National Cleveland Corp., Plastics & Chemicals Div., 1984 State St. Ext., Bridgeport 5, Conn.
National Collapsible Tube Co., 370 Carpenter St., Providence 9, R. I.
National Confectioners' Assn., 221 N. LaSalle St., Chicago, Ill.
•National Equipment Corp., 153-157 Crosby St., New York 12, N. Y.
National Family Opinion, Inc., P.O. Box 315, Toledo 1, Ohio
National Fibre Can & Tube Assn., 1725 I St., N.W., Washington 6, D. C.
National Flexible Packaging Assn., 11750 Shaker Blvd., Cleveland 20, Ohio
National Foil Co., Inc., 913 Newark Ave., Elizabeth 3, N. J.
•National Instrument Co., Inc., 4119 Fordleigh Road, Baltimore 15, Md.
National Label Co., Inc., 19th St. & Indiana Ave., Philadelphia 32, Pa.
National Laboratories & Mfg. Corp., 112 Greenwood Ave., Midland Park, N. J.
National Machinery Co., Greenfield St., Tiffin, Ohio
National Manufacturing Co., 2800 Mercier St., Kansas City 8, Mo.
National Meat Canners Assn., 59 E. Van Buren St., Chicago, Ill.
•National Metallizing Div., Standard Packaging Corp., 825 New York Ave., Trenton, N. J.
National Packaging Corp., 3002 Brooklyn Ave., Fort Wayne, Ind.
National Pallet Corp., 1003 Oliver Building, Pittsburgh 22, Pa.
National Paper Box Mfrs. Assn., 1102 Liberty Trust Bldg., Philadelphia 7, Pa.
National Paper Box Mfg. Co., Second & Somerset Sts., Philadelphia 33, Pa.
National Paper Can & Tube Co., 401 S. Seventh St., Milwaukee 4, Wis.
National Paperboard Assn., 224 S. Michigan Ave., Chicago 4, Ill.
National Plastic Films, Inc., 1541 S. Walnut St., Ottawa, Kan.
National Plastic Products Co., Odenton, Md.
National Printing Equipment Assn., 140 Nassau St., New York 38, N. Y.
National Printing Ink Corp., 123 N. Sangamon St., Chicago 7, Ill.
National Rubber Machinery Co., 47 W. Exchange St., Akron 8, Ohio
National Rubber Stamp Works, 257 W. 38th St., New York 18, N. Y.
National Starch & Chemical Corp., 750 Third Ave., New York 17, N. Y.
National Starch & Chemical Co. (Canada) Ltd., 371 Wallace Ave., Toronto 9, Ont., Canada
National Steel Container Corp., 6700 S. Leclaire Ave., Chicago 38, Ill.
•National Tag Co., The, 332-344 S. Patterson Blvd., Dayton 1, Ohio
National Tin Can Manufactory Co., Inc., 134 W. Third St., New York 12, N. Y.
National Transparent Mfg. Co., Inc., 28 W. 25th St., New York 10, N. Y.
National Transparent Plastics Co., 51 Front St., Indian Orchard, Mass.
National Vacuum Molding Corp., 21 Saw Mill River Road, Yonkers, N. Y.
National Vulcanized Fibre Co., Maryland Ave. & Beech St., Wilmington 99, Del.
National Waterproof Papers, Inc., Railroad & Van Rossum Sts., Beverly, N. J.
National Wax Co., 3650 Touhy Ave., Skokie, Ill.
National Wholesale Druggists Assn., 60 E. 42nd St., New York, N. Y.
National Wooden Box Assn., 402 Barr Bldg., Washington 6, D. C.
National Wooden Pallet Manufacturers Assn., 609 Barr Bldg., Washington 6, D. C.
National-Paper Boxes, Inc., 20th & Tracy St., Kansas City, Mo.
National-Reliable Box & Lumber Co., 161 Marsh St., Newark 5, N. J.
Naugatuck Chemical Div., U. S. Rubber Co., Elm St., Naugatuck, Conn.
Navan Products, Inc., El Segundo, Calif.
Nealis Harrison Ltd., Courtney St., Hull, Yorkshire, England
Nebel Paper Products Co., 1917 Liberty Life Bldg., Charlotte 2, N. C.
Nekoosa-Edwards Paper Co., Port Edwards, Wis.
Nelke Sign Mfg. Co., Inc., 115 Worth St., New York 13, N. Y.
Nelson, B. F., Mfg. Co., The, 401 N.E. Main St., Minneapolis 13, Minn.

Nelson Co., The, 1015 Standard Oil Bldg., Baltimore 2, Md.
Nelson, George, & Associates, 18 E. 50th St., New York, N. Y.
Nelson Label Machine Corp., 683 Frelinghuysen Ave., Newark 5, N. J.
Neo Products Co., 2534-38 S. Kedzie Ave., Chicago 23, Ill.
Neosho Paper Products, 111-113 W. Main St., Chanute, Kan.
Neostyle, Inc., 911 Ridgedale, Birmingham, Mich.
Nesbit Industries, Inc., 1823 Milwaukee Ave., Chicago 47, Ill.
Nesbitt Associates, Ltd., 75 E. 55th St., New York 22, N. Y.
Neubauer, Robert G., Inc., 234 Greenfield St., Fairfield, Conn.
Neuman, J. John., Engineering & Mfg. Co., Yorktown Heights, N. Y.
Neva-Clog Products, Inc., 506 Logan St., Bridgeport 1, Conn.
Nevins Co., The, 800 State Highway #3, Clifton, N. J.
New England Box Co., The, 6 Miles St., Greenfield, Mass.
New England Card & Paper Co., Inc., 20 Hanover St., Springfield 5, Mass.
New England Container Co., Meadow St., Chicopee, Mass.
New England Tape Co., 30 Tower St., Hudson, Mass.
New Era Die Co., Maple St., Red Lion, Pa.
•New Era Mfg. Co., 233 Central Ave., Hawthorne, N. J.
New Haven Board & Carton Co., The, 575 Lexington Ave., New York 22, N. Y.
New Jersey Electronic Co., 109 Eighth St., Passaic, N. J.
•New Jersey Machine Corp., 16th St. & Willow Ave., Hoboken, N. J.
New Jersey Partition & Box Co., Inc., 25 Lexington St., Newark 5, N. J.
New Jersey Transparent Co., Inc., 173 Lott Ave., Brooklyn 12, N. Y.
New London Engineering Co., 1700 Division St., New London, Wis.
New Wrinkle, Inc., 1771 Springfield St., Dayton 3, Ohio
New York Foil Products, 53 Greene St., New York 13, N. Y.
New York Label & Box Corp., 275 Seventh Ave., New York 1, N. Y.
New York Packaging Corp., 1223—39th St., Brooklyn 18, N. Y.
New York Plastics Corp., 640 Dean St., Brooklyn, N. Y.
New York Testing Laboratories, Inc., 47 West St., New York 6, N. Y.
Newark Foils, Inc., 70 Blanchard St., Newark 5, N. J.
Newark Packing Co., 1455 McCarter Hwy., Newark, N. J.
Newark Paper Box Co., 216-228 High St., Newark 2, N. J.
Newark Paraffine Paper Co., 70 Blanchard St., Newark 5, N. J.
Newark Plastic Machinery Corp., 20 Scott St., Newark 2, N. J.
Newburgh Paper Box Co., Inc., 80-88 S. Colden St., Newburgh, N. Y.
Newbury Industries, Inc., Technology Center Bldg., Newbury, Ohio
Newell Div., Clinch-Tite Corp., Box 97, Sandy Lake, Pa.
Newhart Products, Inc., 246 Naugatuck Ave., Milford, Conn.
Newman Labelling Machines Ltd., Queens Road, Barnet, Herts., England
•Newman Tool Co., 65 Bleecker St., New York 12, N. Y.
Newman-Green, Inc., 151 Interstate Road, Addison, Ill.
Newth-Morris Box Corp., 3701 Bank St., Baltimore 24, Md.
Newton, Jack B., 60 Gramercy Park, N., New York 10, N. Y.
Niagara Box Co., Inc., Box 1000, Danbury, Conn.
Niagara Plastics Co., R. D. 3, Edinboro Road, Erie, Pa.
•Nichols Paper Products Co., 615 Willow St., Green Bay, Wis.
Nickelsen, John, 155-17 Sanford Ave., Flushing 55, N. Y.
Nicol, Malcolm, & Co., 39 Utter Ave., Hawthorne, N. J.
Niedringhaus Metal Products Co., 5735 Natural Bridge Road, St. Louis 20, Mo.
Nielsen Lithographing Co., The, 4142 Airport Road, Cincinnati 26, Ohio
Nielsen, William R., 4555 Henry Hudson Pkwy., New York 71, N. Y.
•Niemand Bros., Inc., 45-10—94th St., Elmhurst 73, N. Y.
•Niemand Industries, Inc., 2500 Taylorsville Road, Statesville, N. C.
Nifty Mfg. Div., St. Regis Paper Co., 2110 S. Fifth Ave., Birmingham 3, Ala.
•Nixon-Baldwin Chemicals, Nixon, N. J.
Noble, F. H., & Co., 559 W. 59th St., Chicago 21, Ill.
Noble, M. J., Co., Inc., 2598 Taylor St., San Francisco 11, Calif.
Nolan, James H., Associates, 7720 N. Sheridan Road, Chicago 26, Ill.
Nopco Chemical Co., Plastics Div., 175 Schuyler Ave., No. Arlington, N. J.
Norca Corp., 350 Fifth Ave., New York 1, N. Y.
Norco Manufacturing Co., 392 Bleecker St., New York 14, N. Y.
Norcross Corp., 247 Newtonville Ave., Newton 58, Mass.
Nordic Plastics Co., Inc., 149—20th St., Brooklyn, N. Y.
Nordisk Plaster Industri A/S, Valhojs alle 190, Copenhagen, Denmark
Norman Packaging, 8130 Central Park, Skokie, Ill.
•Normandie Cup Div., Standard Packaging Corp., 119-133 E. Reed Ave., Alexandria, Va.
Normandie Press, Inc., 350 W. Fourth St., New York 14, N. Y.
Norris, James A., Co., 392 Bleecker St., New York 14, N. Y.
Norristown Box Co., Markley St., Norristown, Pa.
Norso Trading Co., Inc., 122 E. 42nd St., New York 17, N. Y.
North American Electric Co., 1715 S. Halsted St., Chicago 8, Ill.
North American Mfg. Co., The, 4455 E. 71st St., Cleveland 5, Ohio
North, Charles W., Studios, Inc., 79 Madison Ave., New York 16, N. Y.
North Star Industries, Inc., 2418 University Ave., S.E., Minneapolis 14, Minn.
Northeast Paper Box Corp., 576 Lawrence St., Lowell, Mass.
Northeastern Plastics, Inc., 215 A St., Boston 10, Mass.
Northern Adhesives, Inc., 83 Apollo St., Brooklyn 22, N. Y.
Northern Container Corp., 55-25—58th St., Maspeth, N. Y.
Northern Cooperage Co., 1821 University Ave., St. Paul 4, Minn.
Northern Electric Co., 5224 N. Kedzie Ave., Chicago 25, Ill.
Northern Glass Co., 118 Sacramento St., San Francisco 11, Calif.
Northern Industrial Chemical Co., 7 Elkins St., So. Boston 27, Mass.
Northgrave Limited, 183 Bathurst St., Toronto, Ont., Canada
•Northland Bag Corp., 53 School St., Yonkers, N. Y.
Northwestern Corrugated Box Co., 1821 N. E. Marshall St., Minneapolis 13, Minn.
Northwestern Glass Co., 5801 E. Marginal Way, Seattle 4, Wash.
Northwestern Paper Box Co., 3131 Western Ave., Seattle 1, Wash.
Norton Chemical Co., Inc., 680 S. Myers St., Los Angeles 23, Calif.
Norton, Inc., 2370 S. Eighth W., Salt Lake City, Utah
Norton Laboratories, Inc., 520 Mill St., Lockport, N. Y.
Norwalk Paper Box Co., The, 50 Newton St., Norwalk, Ohio
Nosco Plastics, Inc., 1701 Gaskell Ave., Erie 6, Pa.
Novel Box Co., 62—18th St., Brooklyn 32, N. Y.
Novelart Mfg. Co., Section Rd. & Penna. R.R., Cincinnati 37, Ohio
Nowland, A. C., Co., 259 N. Front St., Philadelphia 6, Pa.
Nugent-Graham Studios, 412 N. Austin Blvd., Oak Park, Ill.
Nussbaum Novelty Manufacturing Co., 239 S. Jefferson St., Berne, Ind.
Nutting Truck & Caster Co., 1201 W. Division St., Faribault, Minn.
Nylco Products, Inc., 530 Main St., Clinton, Mass.

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OEL, Inc., 600 Pearl St., Elizabeth, N. J.
Oak Printing Co., The, 13200 Enterprise Ave., Cleveland 35, Ohio
Oakland Paper Box Co., 1201 Park Ave., Emeryville 8, Calif.
Oakwood Products Co., Narragansett, R. I.
Obear Nester Glass Co., 20th & Broadway, East St. Louis, Ill.
Oberly & Newell Lithograph Corp., 545 Pearl St., New York 7, N. Y.
O'Connor Paper Box Co., 1106 N. Mariposa Ave., Hollywood 29, Calif.
Odman, Irving L., Co., 108-110 W. Kinzie St., Chicago 10, Ill.
•Ogden Manufacturing Co., 2520 Irving Park Road, Chicago 18, Ill.
O'Grady Containers, Inc., 2418 Cullen, Fort Worth, Texas
Ohio Bag Corp., 154 Post Ave., New York 34, N. Y.
Ohio Corrugating Co., The, 917 Roanoke St., Warren, Ohio
Ohio Knife Co., The, Dreman Ave. & B. & O. R.R., Cincinnati 23, Ohio
Ohio Packaging Co., 3486 E. 142nd St., Cleveland 20, Ohio
Ohio Paper Products Co., The, 346—11th St., S.E., Massillon, Ohio
Oker, Joseph, Sons Co., The, 420 Findlay St., Cincinnati, Ohio
Olach, Inc., 2525 W. Moffat St., Chicago 47, Ill.
Old Dominion Box Co., Inc., 401 S. Gardner Ave., Charlotte 1, N. C.
Old Empire, Inc., 865 Mt. Prospect Ave., Newark 4, N. J.
Old English Printing & Label Co., 1634 Arch St., Philadelphia 3, Pa.
Oldmill Paper Products Corp., 33rd St., & Skillman Ave., Long Island City 1, N. Y.
•Olin, Packaging Div., Film Operations, 460 Park Ave., New York 22, N. Y.
•Olin, Packaging Div., Forest Products Operations, P.O. Box 488, West Monroe, La.
Olive Can Co., 4700 N. Oketo Ave., Chicago 31, Ill.
Oliver Corp., The, A. B. Farquhar Div., 142 N. Duke St., York, Pa.
•Oliver Machinery Co., 445 Sixth St., N.W., Grand Rapids 2, Mich.
Olofsson Corp., The, 2727 Lyons Ave., Lansing 10, Mich.
Olsen, Tinius, Testing Machine Co., Easton Road, Willow Grove, Pa.
Olson, Samuel, Mfg. Co., Inc., 2418 Bloomingdale Ave., Chicago 47, Ill.

Olympic Plastics Co., Inc., 3471 S. La Cienega Blvd., Los Angeles 16, Calif.
O'Malley, M. J., Co., The, 220-224 Franklin St., Springfield 1, Mass.
Omni Products Corp., 460 Park Ave. S., New York 16, N. Y.
•Oneida Paper Products, Inc., 10 Clifton Blvd., Clifton, N. J.
O'Neill, William, 11 E. 44th St., New York, N. Y.
Oppa, E. T., Associates, 155 E. 48th St., New York 1, N. Y.
Oppenheim Co., 47 W. 34th St., New York 1, N. Y.
Opticase Co., The, 150 Dickerson St., Newark 7, N. J.
Orange Products, Inc., 554 Mitchell St., Orange, N. J.
Orangeville Mfg. Co., N. Main St., Orangeville, Pa.
Orchard Paper Co., 3914 N. Union Blvd., St. Louis 15, Mo.
Organico, S.A., 23 Ave. F. D. Roosevelt, Paris 8°, France
Ortman-McCain Co., 1330 W. Washington Blvd., Chicago 7, Ill.
Osborn Charles Associates, Inc., 40 E. 49th St., New York 17, N. Y.
Osborne:Tuttle, Inc., 228 N. LaSalle St., Chicago 1, Ill.
Otsego Falls Paper Mills Div., Menasha Wooden Ware Corp., N. Farmer St., Otsego, Mich.
Ott Packaging Co., 7112 Touhy Ave., Niles, Ill.
Outserts, Inc., Div. Eureka Specialty Printing Co., 530 Electric St., Scranton 9, Pa.
Owens-Corning Fiberglas Corp., 598 Madison Ave., New York 22, N. Y.
•Owens-Illinois Glass Co.
General Offices, P.O. Box 1035-36, Toledo 1, Ohio
•Kimble Glass Co., Sub., P.O. Box 1035-36, Toledo 1, Ohio
•Paper Products Div., P.O. Box 1035-36, Toledo 1, Ohio
Oxford Paper Co., 230 Park Ave., New York 17, N. Y.
Oxo Plastics, Inc., 1171 Myrtle Ave., Brooklyn, N.Y.
Oxy-Dry Sprayer Corp., 1134 W. Montrose Ave., Chicago 13, Ill.
Ozark Forest Products, P.O. Box 102, Fayetteville, Ark.

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•PMC Industries, 293 Hudson St., Hackensack, N. J.
Pabich, W. R., Mfg. Co., Inc., 2323 N. Knox Ave., Chicago 39, Ill.
Pac-Craft, Inc., 6700 N.W. 36th Ave., Miami, Fla.
Pace, Inc., P.O. Box 206, Wilmington 99, Del.
Pacific Coast Foil Co., 177 S. Airport Blvd., So. San Francisco, Calif.
Pacific Label Co., 1231 S. Main St., Los Angeles 15, Calif.
Pacific Paper Box Co., 2424 E. 12th St., Los Angeles 21, Calif.
Pacific Paper Box Co., Inc., 218 N.E. Broadway, Portland 12, Ore.
Pacific Plastic Machinery, Inc., 3443 S. Lawndale St., Chicago 23, Ill.
Pacific Process Printing Co., Inc., 7603 S. Western Ave., Los Angeles 47, Calif.
Pack & Process, Inc., 1604 W. Sixth St., Wilmington 5, Del.
Package Consultants, Inc., 1060 Myrtle Ave., Brooklyn 6, N. Y.
Package Containers, Inc., 336 S.E. Spokane St., Portland 2, Ore.
Package Design Associates, Ltd., 106 Gloucester Pl., London, W. 1, England
Package Designers Council, 331 Madison Ave., New York 17, N. Y.
Package Development Corp., 5847 N. 95th St., Milwaukee 18, Wis.
Package & Display Corp., 27 Rodney St., Brooklyn 11, N. Y.
Package Engineers, Inc., 5500 N.W. Fifth St., Oklahoma City 7, Okla.
Package Forming Machinery Co. Ltd., 352 McRae Drive, Toronto 17, Ont., Canada
•Package Machinery Co., 330 W. Chestnut St., East Longmeadow, Mass.
Package Machines, 10295 Dixie Hwy., Anchorville, Mich.
Package Materials Laboratories, Inc., 461 Crescent Road, Hatboro, Pa.
Package Printing Co., 1702 Riverdale Road, W. Springfield, Mass.
Package Products Co., Inc., 1930 Camden Road, Charlotte 1, N. C.
Package Research Laboratory, Rockaway, N. J.
Package Supply Co., 135 E. Plumstead Ave., Lansdowne, Pa.
Package-Craft, Inc., 22 Morton St., Paterson 3, N. J.
Packageers Co., 500 N. Dearborn St., Chicago 10, Ill.
Packageneers, Inc., 4618 Flat Shoals Rd., Decatur, Ga.
Packaging Arts, Inc., 10 E. 40th St., New York 16, N. Y.
Packaging Assn. of Canada, 1835 Yonge St., Toronto 7, Ont., Canada
•Packaging Components, Inc., 171 Madison Ave., New York 16, N. Y.
Packaging Consultants, Inc., 4380 MacArthur Blvd., N.W., Washington 7, D. C.
Packaging & Converting Co., Inc., 4380 MacArthur Blvd., N.W., Washington 7, D. C.
•Packaging Corp. of America, 1372 Wilson St., Los Angeles 21, Calif.
•Packaging Corp. of America, 1632 Chicago Ave., Evanston, Ill.
Packaging Development Associates, 2116 Walnut St., Philadelphia 3, Pa.
Packaging Engineering Co., 5333 No. Cahuenga Blvd., No. Hollywood, Calif.
Packaging Engineering Co., 24-15—45th St., Long Island City 3, N. Y.
Packaging Equipment Co., 3240 Peachtree Rd., N.E., Atlanta, Ga.
Packaging Equipment Co., 528 Bergen St., Brooklyn, N. Y.
Packaging Frontiers, Inc., P.O. Box 537, Waltham, Mass.
•Packaging Industries Limited, Inc., 151 Pine St., Montclair, N. J.
Packaging Institute, Inc., 342 Madison Ave., New York 17, N. Y.
Packaging Laboratories & Designing Ltd., P.O. Box 40, Victoria Station, Montreal 6, Que., Canada
Packaging Machinery Mfrs. Institute, Inc., 60 E. 42nd St., Room 863, New York 17, N. Y.
Packaging Materials Corp., 104 E. 40th St., New York 16, N. Y.
Packaging Pioneers, Inc., Tuckahoe, N. Y.
Packaging Products, Inc., 1101 Guinotte St., Kansas City 20, Mo.
Packaging Products & Design Corp., 850 Frelinghuysen Ave., Newark, N. J.
Packaging Service Corp., 7602 S. Greenwood Ave., Chicago 19, Ill.
Packaging Services, Inc., Foot of Madison St., Wilmington 99, Del.
Packard Container Corp., 226 Grand St., Hoboken, N. J.
•Packer Machinery Corp., 109—14th St., Brooklyn 15, N. Y.
Packers Package, Inc., 108 E. Centennial Ave., Muncie, Ind.
Packet Research Corp., 55 Oliver St., Boston 10, Mass.
Packing Equipment Div., FMC Corp., 3075—14th St., Riverside, Calif.
Packing Material Co., Inc., 16232 James Couzens Hwy., Detroit 21, Mich.
Packmasters, 1056 Home Ave., Akron 10, Ohio
•Packomatic Div., Textile Machine Works, Reading, Pa.
•Pack-Rite Machines, Div. Techtmann Industries, Inc., 407 E. Michigan St., Milwaukee 1, Wis.
Paco Div., Inlander-Steindler Paper Co., 2700 N. Karlov Ave., Chicago 39, Ill.
Paco Winders, Inc., 2207 Bridge St., Philadelphia 37, Pa.
Pacon Machines Corp., 76 Ninth Ave., New York 11, N. Y.
Pacon Products Corp., 10¾ Macdougal Alley, New York 11, N. Y.
Pac-Tron, Inc., Mystic, Conn.
Paige, Richard E., Inc., 95 Madison Ave., New York, N. Y.
Painter, Teague & Petertil, 230 N. Michigan Ave., Chicago 1, Ill.
Paisley, T. J., Co., The, State Road, Medina, Ohio
Paket Corp., 9022 S. Baltimore Ave., Chicago 17, Ill.
•Pak-Rapid, Inc., 18 Elizabeth St., West Conshohocken, Pa.
Pak-Rite Flexible Packaging Co., 275 Green St., Brooklyn 22, N. Y.
Pallet Sales Corp., 122 E. 42nd St., New York 17, N. Y.
Palm Brothers Decalcomania Co., The, 3736 Regent Ave., Cincinnati 12, Ohio
Palm, Fechteler & Co., 85-89 Maple St., Weehawken, N. J.
Palma-Knapp Associates, 412 Thatcher Ave., River Forest, Ill.
Palmer Associates, 51 E. 42nd St., New York 17, N. Y.
Palmer Supplies Co. of Florida, 4471 N.W. 36th St., Miami Springs 66, Fla.
Palmer-Bee Co., 3022 Opdyke Road, Bloomfield Hills, Mich.
Palo Laboratory Supplies, Inc., 75 Ninth Ave., New York 11, N. Y.
Palographia Co., The, 74 Lafayette St., New York 13, N. Y.
Paltier Corp., The, 1701 Kentucky St., Michigan City, Ind.
Pamarco, Inc., 235 E. Eleventh Ave., Roselle, N. J.
Pan Industrial Corp., 38 W. 21st St., New York 10, N. Y.
Panamerican Plastics, Inc., 3400 Armstrong Ave., Dallas 5, Texas
Pan-American Supply Co., 15 W. 44th St., New York, N. Y.
Panelyte Div., St. Regis Paper Co., Cambridge, Ohio
Pannier Corp., The, 207 Sandusky St., Pittsburgh 12, Pa.
Pan-O-Ramic Package Co., Inc., 122 N. Franklin St., Janesville, Wis.
Pan-Pak, Inc., High St., Attica, N. Y.
Pantasote Co., The, Panta-Pak Div., 415 Madison Ave., New York 17, N. Y.
Pantone, Inc., 461 Eighth Ave., New York 1, N. Y.
Paper Bag Institute, Inc., The, 41 E. 42nd St., New York 17, N. Y.
Paper Can Association, 1532 Philadelphia Nat'l. Bank Bldg., Philadelphia 7, Pa.
Paper Center, Inc., The, 311 E. 47th St., New York 17, N. Y.
Paper Chemicals, Inc., 168-70—93rd Ave., Jamaica 3, N. Y.
Paper Coating & Converting Co., Inc., 611 William St., Baltimore 30, Md.
Paper Converters Co., 1745 E. Slauson Ave., Los Angeles 58, Calif.
Paper Converting & Finishing Co., 1101 S. Kilbourn Ave., Chicago 24, Ill.

Paper Converting Machine Co., 2300 S. Ashland Ave., Green Bay, Wis.
Paper Corp. of United States, 630 Fifth Ave., New York 20, N. Y.
Paper Cup & Container Institute, Inc., 250 Park Ave., New York, N. Y.
Paper Dynamics, Inc., 445 N. Lake Shore Dr., Chicago 11, Ill.
Paper Industry Instruments, 2000 Lee Rd., Cleveland 20, Ohio
Paper Machinery Corp., 3718 W. Lancaster Ave., Milwaukee 9, Wis.
Paper Manufacturers Co., 9800 Bustleton Ave., Philadelphia 15, Pa.
•Paper Package Co., Div. Creative Packaging, Inc., 1036 N. Capitol Ave., Indianapolis 6, Ind.
Paper Pail Assn., 111 W. Washington St., Chicago 2, Ill.
Paper Products Manufacturing Co., Paper Mill Road, Swarthmore, Pa.
Paper Quality Control, 1130 Hardscrabble Road, Chappaqua, N. Y.
Paper Shipping Sack Mfrs. Assn., Inc., 370 Lexington Ave., New York 17, N.Y.
Paperboard Laminating Corp., 235 Main St., Norwalk, Conn.
Paperbox Corp., 950–63rd St., Oakland 8, Calif.
Papercraft Corp., The, 5850 Centre Ave., Pittsburgh 6, Pa.
Paperkraft Boxes, Inc., 2210 Temple St., Los Angeles 26, Calif.
Paps, Costis J., Assoc., 806 W. Van Buren St., Chicago 7, Ill.
Papyrus Co., The, 50 Market St., Kenilworth, N. J.
Par Industries, Inc., 2193 E. 14th St., Los Angeles 21, Calif.
Para Plate & Plastics Co., Inc., 3242 E. Olympic Blvd., Los Angeles 23, Calif.
Paraffined Carton Assn., 111 W. Washington St., Chicago 2, Ill.
Paragon Box Co., 745 Trabert Ave., N.W., Atlanta 18, Ga.
Paragon Molded Plastics, Inc., 1422 Seneca St., Seattle 1, Wash.
Paramount Foam Industries, 525 Oritan Ave., Ridgefield, N. J.
Paramount Packaging Corp., 3111 W. Allegheny Ave., Philadelphia 32, Pa.
Paramount Paper Products Co., 4402 N. 23rd St., Omaha 10, Neb.
Paramount Paper Tube Corp., 614 S. Lafayette St., Fort Wayne 2, Ind.
Parfait Packaging Co., Inc., 36 W. 15th St., New York 11, N. Y.
Paris Cosmetics, Inc., 99-02 Roosevelt Ave., Corona 68, N. Y.
Park, Helen, 1058 Second Ave., New York, N. Y.
Park Packaging Co., 217 Somerset St., New Brunswick, N. J.
Park Plastics Co., 104 E. Elizabeth Ave., Linden, N. J.
Parker Kalon Div., General American Transportation Corp., 1 Peekay Drive, Clifton, N. J.
Parkway Plastics, Inc., Stelton Road, New Market, N. J.
Parnat Business Machines Corp., 1816 Boston Road, Bronx 60, N. Y.
Par-Pak Co., Inc., The, 19850 Ingersoll Drive, Cleveland 16, Ohio
Parrot Litho A/S, Solvgade 32, Copenhagen K, Denmark
Parsons, W. A., Co., Inc., 1 Middletown Rd., Durham 1, Conn.
Parsons & Whittemore Graphic Corp., 250 Park Ave., New York 17, N. Y.
Par-Way Custom Packaging, 5136 Firestone Place, South Gate, Calif.
Paslode Co., 5860 Northwest Hwy., Chicago 31, Ill.
Patent Plastics Products Corp., 738 Broadway, New York, N. Y.
Paterson Parchment Paper Co., Bristol, Pa.
Paton, Calvert & Co., Ltd., Binns Road, Liverpool 13, Lancs., England
Patron Transmission Co., Inc., 129 Grand St., New York 13, N. Y.
Payne, Ernest, Corp., 82 Beekman St., New York 38, N. Y.
Pearce Development Co., 1606 E. 30th St., Cleveland 14, Ohio
Pearson Industries, 27-10–44th Drive, Long Island City 1, N. Y.
Peavey, Lynn, Co., 9922 Horton Drive, Overland Park, Kan.
Peco Corp., 111 Ortega Ave., Mountain View, Calif.
Pee Cee Tape & Label Co., Inc., 521 N. LaBrea Ave., Los Angeles 36, Calif.
Peerless Confectionery Equipment Co., 97 Wooster St., New York 12, N. Y.
Peerless Molded Plastics, Inc., 401 Hamilton St., Toledo 2, Ohio
Peerless Packages, Inc., 2545 E. 79th St., Cleveland 4, Ohio
Peerless Paper Box Co., Inc., 149 Wooster St., New York 12, N. Y.
•Peerless Roll Leaf Co., Div. Howe Sound Co., 4511 New York Ave., Union City, N. J.
•Peerless Tube Co., Inc., 58-76 Locust Ave., Bloomfield, N. J.
Pegasus International Corp., 1 E. 53rd St., New York 22, N. Y.
Pein Box & Lumber Co., 1002 S. E. Ninth Ave., Portland 14, Ore.
Pelican Plastics, Inc., 422 E. Main St., Homer, La.
Pell Paper Box Co., P.O. Box 508, Elizabeth City, N. C.
Pemco, Inc., Sheboygan, Wis.
Pen Mac Nye Co., The, 1056 Home Ave., Akron 10, Ohio
Penick & Ford Ltd., 750 Third Ave., New York 17, N. Y.
Penland Paper Converting Corp., 310 Pine St., Hanover, Pa.
Penn Bottle & Supply Co., 5619 Cherry St., Philadelphia 39, Pa.
Penn Cork & Closures, Inc., 1155 Manhattan Ave., Brooklyn 22, N. Y.
Penn Lithographing Co., 3115 Ridge Ave., Philadelphia 21, Pa.
Penn-Central Co., The, 2727 Roe Lane, Kansas City 3, Kan.
Pennsalt Chemicals Corp., 3 Penn Center, Philadelphia 2, Pa.
Pennsylvania Box & Lumber Co., Terwood Road, Willow Grove, Pa.
•Pennsylvania Glass Products Co., Inc., 438 N. Craig St., Pittsburgh 13, Pa.
Pennsylvania Industrial Chemical Corp., 120 State St., Clairton, Pa.
Penny Plate, Inc., 30 Washington Ave., Haddonfield, N. J.
Penraat, Jaap, Associates, 315 Central Park W., New York 25, N. Y.
Peoria Plastic Co., 215 Taylor Ave., East Peoria, Ill.
Perfect Finishing Co., Inc., 200 Varick St., New York 14, N. Y.
Perfection Packaging, Inc., 3400 Main St., Skokie, Ill.
Perfection Packaging, Inc., 1112 Brook Ave., Bronx 29, N. Y.
Perforated Specialties Co., Inc., 351 W. 35th St., New York 1, N. Y.
Perina, Frank A., Jr., 2242 Balmoral Ave., Union, N. J.
Perkins, B. F., & Son, Inc., Holyoke, Mass.
Perl Machine Mfg. Co., Inc., 68 Jay St., Brooklyn 1, N. Y.
Perma Wire Display Corp., 72-76 Greene St., New York 12, N. Y.
Permacel, U. S. Highway #1, New Brunswick, N. J.
Perma-Flex Industries Ltd., 90 Bridgeland Ave., Toronto 19, Ont., Canada
Perma-Flex Roller Corp., 69 Leddy St., Buffalo 10, N. Y.
Permanent Label Corp., 49 Ackerman St., Bloomfield, N. J.
Permo-O-Last Finishing Co., The, 205 Cherry St., Waterbury, Conn.
Perry Envelope & Bag Co., Inc., 3639 Dyre Ave., New York 66, N. Y.
•Perry Industries, Inc., 204 Third St., Brooklyn 15, N. Y.
Perry Plastics, Inc., 3409 W. 14th St., Erie, Pa.
•Personal Products Corp., Cel-Fibe Div., Milltown, N. J.
•Peter Partition Corp., 124 Boerum Place, Brooklyn 1, N. Y.
Peters Chemical Mfg. Co., 3623 Lake St., Melrose Park, Ill.
•Peters Machinery Co., 4700 Ravenswood Ave., Chicago 40, Ill.
Peters, Ralph E., Co., 420 Market St., San Francisco 11, Calif.
Peterson Filling & Packaging Co., Hegeler Lane, Danville, Ill.
Petroleum Solvents Corp., 9 E. 45th St., New York 17, N. Y.
Petroleum Specialties, Inc., 205 E. 42nd St., New York 17, N. Y.
Pettibone Mulliken Corp., 4700 W. Division St., Chicago 51, Ill.
Pexco Bag Mfg. Co., 201 Morris St., Toledo 4, Ohio
Pfaudler Div., Pfaudler Permutit, Inc., 1000 West Ave., Rochester 3, N. Y.
Pfizer, Charles, & Co., Inc., Plastic & Plasticizer Dept., 235 E. 42nd St., New York 17, N. Y.
Pharmacy Paper Box Co., Inc., 3401 W. Division St., Chicago 51, Ill.
PharmaPlastics, Inc., 205 S. Smallwood St., Baltimore 23, Md.
Phelps Manufacturing Co., Inc., 914-920 N. 15th St., Terre Haute, Ind.
Philadelphia Folding Box Co., Inc., 36 E. Oregon Ave., Philadelphia 48, Pa.
Philadelphia Quartz Co., 1146P Public Ledger Bldg., Philadelphia 6, Pa.
Philipp Lithographing Co., 1960 Wisconsin Ave., Grafton, Wis.
Philipson Press, 531 Gates Ave., Brooklyn 16, N. Y.
Phillips Associates, 6003 Market St., Oakland 8, Calif.
Phillips Chemical Co., Adams Bldg., Bartlesville, Okla.
Phillips, Thos., Co., The, 23 W. Exchange St., Akron 8, Ohio
Phillips-Joanna Co., 5229 Touhy Ave., Skokie, Ill.
Philo, L. H., Corp., 460 W. 34th St., New York 1, N. Y.
Phin Sales Co., Ltd., 26 Lipton Ave., Toronto 6, Ont., Canada
Phoenix Industries Div., Mullen Container Corp., 1020 N. Rush St., Chicago 11, Ill.
Phoenix Metal Cap Co., 2444 W. 16th St., Chicago 30, Ill.
Phoenix Products Co., 4715 N. 27th St., Milwaukee 9, Wis.
Phoenix Steel Container Co., Inc., 34 Avenue A, Bayonne, N. J.
Photo Process Screen Mfg. Co., 179 W. Berks St., Philadelphia 22, Pa.
Photobell Co., Inc., 12 E. 22nd St., New York 10, N. Y.
Photomation, Inc., Polaris & Wright Aves., Mountain View, Calif.
Photovolt Corp., 95 Madison Ave., New York 16, N. Y.
Picken, Mary Brooks, 11 E. 73rd St., New York, N. Y.
Pickwick Papers, Inc., 33 Bethune St., New York 14, N. Y.
Pictorial Paper Package Corp., 232 S. Lake St., Aurora, Ill.
Pictorial Productions, Inc., 60 Kingsbridge Road E., Mt. Vernon, N. Y.
Piedmont Label Co., Inc., 311 W. Depot St., Bedford, Va.

Pie-Pak Co., Inc., 1300 Hudson St., Hoboken, N. J.
Pierce Glass Co., Railroad Ave., Port Allegany, Pa.
Pierce & Stevens Chemical Corp., 710 Ohio St., Buffalo 3, N. Y.
Pierce Wrapping Machine Co., 1100 E. 31st St., LaGrange Park, Ill.
Pierson Industries, Inc., 131 State St., Boston 9, Mass.
Pinkerton Folding Box Co., The, 4001 N. Ravenswood Ave., Chicago 13, Ill.
Pioneer Can Co., Inc., 51 Market St., East Paterson, N. J.
Pioneer Cooperage Co. of Illinois, 450 N. Hoyne Ave., Chicago 12, Ill.
Pioneer Folding Box, Inc., 165 Front St., Chicopee, Mass.
Pioneer Mounting & Finishing Co., Inc., 12-01–34th Ave., Long Island City 1, N. Y.
Pioneer Paper Stock Co., 2600 N. Elston Ave., Chicago 47, Ill.
Pioneer Printing Ink Corp., 1785 N. Telegraph Road, Monroe, Mich.
Pioneer Valley Plastics Co., 325 Silver St., Agawam, Mass.
Pioneer Wire Stitcher Co., Amber & Hagert Sts., Philadelphia 25, Pa.
Piqua Paper Box Co., The, 616 Covington Ave., Piqua, Ohio
Pitkin, Lucius, Inc., 47 Fulton St., New York 38, N. Y.
Pitney-Bowes, Inc., Walnut & Pacific Sts., Stamford, Conn.
Pittsburgh Penn Oil Co., 36th St. & A.V.R.R., Pittsburgh 1, Pa.
Pittsburgh Plastics Div., Heekin Can Co., P.O. Box 28, New Castle, Pa.
Pittsburgh Plate Glass Co., Fiber Glass Div., 1 Gateway Center, Pittsburgh 22, Pa.
Plageman Enterprises, Inc., 405 E. 200th St., Cleveland 19, Ohio
Planned Displays, Inc., 45 Granite St., Leominster, Mass.
Planned Sales Limited, 1067 Yonge St., Toronto, Ont., Canada
Plastal Specialties Co., 116 W. Denny Way, Seattle 99, Wash.
•Plas-Tech, Inc., 1821 University Ave., St. Paul 4, Minn.
Plastene Corp., Crawfordsville, Ind.
Plastic Art Metallizing Corp., 68-70 Freeman St., Brooklyn 22, N. Y.
•Plastic Artisans, Inc., Dock St. & Martin Place, Port Chester, N. Y.
Plastic Assembled Products, Inc., 1200 Rosedale Ave., Baltimore 6, Md.
•Plastic Bottle & Tube Div., Continental Can Co., Inc., 2930 N. Ashland Ave., Chicago 13, Ill.
Plastic Box Co., 2500–18th St., San Francisco 10, Calif.
Plastic Coating Corp., The, 38 Winter St., Holyoke 1, Mass.
Plastic Container Corp., P.O. Box 800, Brattleboro, Vt.
Plastic Enterprises, 20-16–130th St., College Point 56, N. Y.
Plastic Extrusion & Engineering Co., Inc., 17 E. Main St., Westboro, Mass.
Plastic Film Co., Inc., Community Ave., Plainfield, Conn.
Plastic Film Products Corp., 58 W. Exchange St., Akron 8, Ohio
Plastic Food Container Assn., 333 N. Michigan Ave., Chicago 1, Ill.
Plastic Horizons, Inc., 1 Erie St., Paterson 1, N. J.
Plastic Industries, Inc., Box 224, Athens, Tenn.
Plastic Inlays, Inc., 282 Broad St., Summit, N. J.
Plastic Materials & Polymers, Inc., New South Road, Hicksville, N. Y.
Plastic Molded Products Co., 6044 N. Pulaski Road, Chicago 46, Ill.
•Plastic Packaging Co., 2035 W. Charleston St., Chicago 13, Ill.
Plastic Packaging Corp., 165 Front St., Chicopee, Mass.
Plastic Parts Corp., 1701 Nebraska Ave., Toledo 7, Ohio
Plastic Products, Inc., Pine St., So. Norwalk, Conn.
Plastic Products Mfrs. Assn., Inc., 1133 Broadway, New York 10, N. Y.
Plastic Slitting Corp., 259-269 Green St., Brooklyn 22, N. Y.
Plastic Suppliers, P.O. Box 85, Blackwood, N. J.
Plastic Welding Corp., 841 Frelinghuysen Ave., Newark 12, N. J.
Plastican Corp., P.O. Box 157, Butler, N. J.
Plasticite Corp., 327 Rider Ave., Bronx 51, N. Y.
Plasticon Corp., 2212 Foshay Tower, Minneapolis 2, Minn.
•Plastics Div., Allied Chemical Corp., 40 Rector St., New York 6, N. Y.
Plastics by Hoover, 430 W. 13th St., Huntington, W. Va.
Plastics & Coal Chemicals Div., Allied Chemical Corp., 40 Rector St., New York 6, N. Y.
Plastics Engineering Co., 1607 Geele Ave., Sheboygan, Wis.
Plastics & Equipment Sales Co., 8232 Major Ave., Morton Grove, Ill.
Plastics, Inc., 224 Ryan Ave., St. Paul 2, Minn.
Plastics & Resins Div., American Cyanamid Co., Wallingford, Conn.
•Plas-Ties Co., 624 Poinsettia St., Santa Ana, Calif.
Plasti-Form, Inc., 555 Warren St., Phillipsburg, N. J.
Plasti-Kote, Inc., 9801 Harvard Ave., Cleveland 5, Ohio
Plastineers, Inc., 2127 E. Lake St., Minneapolis 7, Minn.
Plasti-Pak Containers, Ltd., 7 Plastics Ave., Toronto 18, Ont., Canada
Plasti-Vue Mfg. Co., Inc., 321 S. Main St., Fort Worth, Texas
•Plastofilm, Inc., 916 W. Union Ave., Wheaton, Ill.
Plastomatic Corp., King & Bridge Sts., Malvern, Pa.
Plast-O-Pak Corp., 39 Spruce St., Leominster, Mass.
•Plast-O-Tron, Inc., 391 Mulberry St., Newark, N. J.
Platt Corp., 1415 Key Highway, Baltimore 30, Md.
•Plax Corp., P.O. Box 1019, Hartford 1, Conn.
•Plaxall, Inc., 5-26–46th Ave., Long Island City 1, N. Y.
Plicose Manufacturing Corp., 16 E. 34th St., New York, N. Y.
Plumly, Geo. W., Co., Inc., 253 N. 12th St., Philadelphia 7, Pa.
Plyfiber Container Corp., 855 Woodruff Lane, Elizabeth, N. J.
Pneuma-Flo Systems, Inc., 127 W. 24th St., New York 11, N. Y.
•Pneumatic Scale Corp., Ltd.
General Offices, 82 Newport Ave., Quincy 71, Mass.
•Carbert Mfg. Co., Div., 82 Newport Ave., Quincy 71, Mass.
Pohlig Bros., Inc., 2419 E. Franklin St., Richmond 23, Va.
Point-of-Purchase Advertising Institute, 11 W. 42nd St., New York 36, N. Y.
Polar Container Corp., 625 Diversey Pkwy., Chicago 14, Ill.
Poliner, William, 1300 Alicia Ave., West Englewood, N. J.
Pollard Bros. Mfg. Co., Inc., 5504 Northwest Hwy., Chicago 30, Ill.
Pollock Paper Co., Div. St. Regis Paper Co., 2236 Cockrell St., Dallas 22, Texas
Polo Plastics Co., 1718 N. First St., Milwaukee 12, Wis.
Poly Perm Printing, Inc., 64 W. 23rd St., New York 10, N. Y.
Poly Plastic Products, Inc., 2 Fourth Ave., Paterson 4, N. J.
Polychrome Corp., 2 Ashburton Ave., Yonkers 2, N. Y.
Polycraft Bag Co., Inc., 2345 Schumacher Drive, Mishawaka, Ind.
Polycraft Co., Ltd., 8650 Jeanne Mance, Montreal, Que., Canada
Polycrafters, Inc., 746 S. Central Ave., Los Angeles 21, Calif.
Polyethylene Corp. of America, Route 130, Cranbury, N. J.
Polyfab Co., 2855 W. Ave. 35, Los Angeles 65, Calif.
Polyflex Bag & Container, Inc., 85 E. Main St., Johnstown, N. Y.
Polygon Products Co., 1432-1434 W. Lake St., Chicago 7, Ill.
Polyken Sales Div., The Kendall Co., 309 W. Jackson St., Chicago 6, Ill.
Poly-Kote, Inc., 82 Chestnut St., No. Attleboro, Mass.
•Polymer Chemicals Div., W. R. Grace & Co., 225 Allwood Rd., Clifton, N. J.
Polymer Industries, Inc., Viaduct Road, Springdale, Conn.
Polymeroid Co., Inc., 90-02 Atlantic Ave., Woodhaven, N. Y.
Poly-Pak Corp. of America, 26 Fahey St., Springdale, Conn.
Poly-Pak, Inc., 6117 Page Blvd., St. Louis 33, Mo.
Polypane Packaging Co., Inc., P.O. Box 974, San Juan, Puerto Rico
Poly-Seal Corp., The, 60 E. 42nd St., New York 17, N. Y.
Polytex Industrial Finishes Corp., 5-31–47th Ave., Long Island City 1, N. Y.
Polytop Corp., P.O. Box 24, Hingham, Mass.
Ponten, Jean S., Co., 600 Sixteenth St., Oakland 12, Calif.
Pontiac Graphics Corp., 812 W. Van Buren St., Chicago 7, Ill.
Pope & Gray, Inc., 17 Industrial West St., Clifton, N. J.
Popper & Sons, Inc., 300 Fourth Ave., New York 10, N. Y.
Poris, Harry, Co., 305 West End Ave., New York 23, N. Y.
Port Huron Sulphite & Paper Co., Foot of Washington Ave., Port Huron, Mich.
Port Studios, 15 E. Delaware, Chicago 11, Ill.
Portco Corp., Paper & Plastic Div., Vancouver 1, Wash.
•Porter & Dugas, Inc., 626 S. Clark St., Chicago 5, Ill.
Porter & Goodman Design Associates, 7777 Sunset Blvd., Los Angeles, Calif.
Porter, H. K., Co., Inc., Riverside-Alloy Metal Div., 1 Pavilion Ave., Riverside, N. J.
Portland Box Co., Inc., 700 Warren Ave., Portland, Maine
Portland Co., The, 58 Fore St., Portland, Maine
Portland Label Co., Inc., 8312 S.E. 17th Ave., Portland 2, Ore.
Posner, S., Sons, Inc., Metropolitan & Scott Aves., Brooklyn 37, N. Y.
Possis Machine Corp., 825 Rhode Island Ave. S., Minneapolis 26, Minn.
Post, Herbert A., Inc., 31-11–20th Rd., Long Island City 5, N. Y.
Post Machinery Co., 140 Elliott St., Beverly, Mass.
Poster Packaging, Inc., 3401 W. Division St., Chicago 51, Ill.
Potdevin Machine Co., 294 North St., Teterboro, N. J.
Potlatch Forests, Inc., Lewiston, Idaho
Potlatch Forests, Inc., Penn-Mar Div., 1501 Russell St., Baltimore 30, Md.

Pottsville Box Corp., Railroad & Water Sts., Pottsville, Pa.
Powell, Gerry, Associates, 303 W. 42nd St., New York 36, N. Y.
Power Curve Conveyor Co., 2185 S. Jason St., Denver 23, Colo.
Powers, Joseph, 146 E. 34th St., New York 16, N. Y.
Powr-Pak, Inc., 145 Howard Ave., Bridgeport 5, Conn.
Pratt Manufacturing Corp., 3097 W. Mill Rd., Milwaukee 9, Wis
Pratt & Whitney, Inc., West Hartford 1, Conn.
Precise Engineering Co., The, 221 E. Main St., Huntley, Ill.
Preci-Matic Corp., 60 E. 42nd St., New York 17, N. Y.
Precision Carton Co., Aurora, Ill.
Precision Machine & Development Co., New Castle, Del.
Precision Paper Tube Co., 2035 W. Charleston St., Chicago 47, Ill.
Precision Parts Co., Inc., Park Ave. & Haddonfield Road, Pennsauken, N. J.
Precision Plastic Products, Inc., 225 N. Racine Ave., Chicago, Ill.
Precision Plastics Co., 4655 Stenton Ave., Philadelphia 44, Pa.
Precision Products Co., Inc., 252 E. 16th St., Paterson, N. J.
Precision Staple Corp., 3944 Dearborn Ave., Sarasota, Fla.
•Precision Valve Corp., 700 Nepperhan Ave., Yonkers 3, N. Y.
Premier Bag Co., Inc., 700 Pennsylvania Ave., Lyndhurst, N. J.
Premier Carton Co., Burbank & Layton Sts., Cincinnati 6, Ohio
Premier Carton Corp., 336 W. 37th St., Chicago 9, Ill.
Premier Packages, Inc., 9438 Watson Industrial Park, St. Louis 26, Mo.
Premier Paper Box Co., 2851–21st St., San Francisco 10, Calif.
Premium Plastics, Inc., 2440 S. Indiana Ave., Chicago 16, Ill.
Prentice Products Co., Baer Field, Fort Wayne, Ind.
Prepac, Inc., 188 W. 230th St., New York 63, N. Y.
Pre-Portion Corp., P.O. Box 51, Jamaica 19, N. Y.
Preservation Packaging, Inc., 1407 Chestnut Ave., Hillside 5, N. J.
Presin Co., Inc., 2014 Broadway, Santa Monica, Calif.
Pres-Pak Valve Corp., 2060 Happy Lane, St. Louis 25, Mo.
Presque Isle Paper Products, Inc., 859 E. Eighth St., Erie, Pa.
Pressed Steel Tank Co., 1445 S. 66th St., Milwaukee 14, Wis.
Presstite-Keystone Products Div., American-Marietta Co., 3738 Chouteau Ave., St. Louis 10, Mo.
Pressure Aerosols Filling Co., Ravens Lane, Berkhamsted, Herts., England
Pressure-Pack, Inc., 18550 Mack Ave., Detroit 2, Mich.
•Pressure Pak, Inc., 420 Monceaux Road, W. Palm Beach, Fla.
Pressure Products Co., 845 Lincoln Ave., West Chester, Pa.
Pressure Sensitive Tape Council, 1201 Waukegan Rd., Glenview, Ill.
Pres-Sure-Stik Corp., 327-35 E. 29th St., New York 16, N. Y.
Pressurform Container Corp., Baltimore Pike & Wallingford Road, Swarthmore, Pa.
Prestige Press, Inc., 88 University Pl., New York, N. Y.
Presto Adhesive Paper Co., Inc., 1245 Flower St., Glendale 1, Calif.
Presto Plastic Products Co., Inc., 11 E. 26th St., New York 10, N. Y.
Price Bros. Lithograph Co., P.O. Box 444, Bridgeton, N. J.
Print All Corp., 116 Nassau St., Brooklyn 1, N. Y.
Printcraft Corp., Center & Martin Sts., Lexington, N. C.
Print-Craft of Houston, 6713 Kassarine Pass, Houston 33, Texas
Printed Plastics, Inc., 2636 S. Shields Ave., Chicago 16, Ill.
Printed Products, Inc., 455 Wagner Pl., Memphis, Tenn.
Printers Finishing & Mfg. Co., Inc., 611 William St., Baltimore 30, Md.
Printing Developments, Inc., Sub. Time, Inc., Time & Life Bldg., New York 20, N. Y.
Printing Machinery Co., The, 436 Commercial Sq., Cincinnati 2, Ohio
Printloid, Inc., 10-10–44th Ave., Long Island City 1, N. Y.
Printon Corp., 310 E. 23rd St., New York 10, N. Y.
Private Brands Co., Div. W. P. C. Enterprises, 5 Lawrence St., Bloomfield, N. J.
Process Displays, Inc., 717 S. Sixth St., Milwaukee 4, Wis.
Prodex Corp., King George Rd., Fords, N. J.
Prodigo, Edward F., Inc., 2 W. Clinton Ave., Tenafly, N. J.
Produce Packaging Assn., Inc., P.O. Box 29, Newark, Del.
Producers Exchange, Inc., 32 S. Huron St., Toledo 4, Ohio
Product Counselors, Inc., 145 E. 57th St., New York 22, N. Y.
Product Design & Engineering, Inc., 750 S. Florida Ave., Minneapolis 26, Minn.
Product & Packaging Design, Inc., 1077 Celestial St., Cincinnati 2, Ohio
Product Techniques, Inc., 215 N. Main St., Hudson, Ohio
•Production Equipment, Inc., Div. The Burnet Co., E. Midland Ave., Paramus, N. J.
Production Metal Products Co., Inc., 421 N. Sangamon St., Chicago 22, Ill.
•Producto Machine Co., The, 996 Housatonic Ave., Bridgeport 1, Conn.
Products Filling & Packaging Co., 225 W. Illinois St., Chicago 10, Ill.
•Products Packaging, Inc., 6400 Herman Ave., Cleveland 2, Ohio
Progress Lithographing Co., The, Section Rd. & Penna. R.R., Cincinnati 37, Ohio
Progressive Can Machinery, P.O. Box 308, Alvarado, Calif.
Progressive Electronics Co., Inc., 125 Dayton Ave., Passaic, N. J.
Prolon Plastics Div., Prophylactic Brush Co., Pine St., Florence, Mass.
Promotion Design Associates, Inc., 145 E. 57th St., New York 22, N. Y.
Promotional Container Co., 60 Branford Pl., Newark 2, N. J.
Pro-Pak, 5105 S.W. 45th Ave., Portland 22, Ore.
Propak, Inc., 125 Perkins Ave., Brockton 69, Mass.
Protective Coatings Corp., 64 Ackerman Ave., Clifton, N. J.
•Protective Lining Corp., 601–39th St., Brooklyn 32, N. Y.
Protective Papers, Inc., Union, Ill.
Protect-O-Seal, 600 E. 16th Ave., No. Kansas City, Mo.
Protexall Permanent Process Service, 416 E. Ninth St., Kansas City 6, Mo.
Pryor Marking Products, 434 S. Wabash St., Chicago 5, Ill.
Puchkoff, P., & Sons, Inc., 220 Kosciusko St., Brooklyn 16, N. Y.
Puget Sound Paper Box Co., 707 Snoqualmie St., Seattle 8, Wash.
Puget Sound Pulp & Timber Co., Box 954, Bellingham, Wash.
Pulp Reproduction Co., 3000 W. Clarke St., Milwaukee 45, Wis.
Purdy Machinery Co. Ltd., 41-42 Prescot St., London, E.1, England
Puritan Aerosol Corp., 160 Washington St., N., Boston 14, Mass.
Puritan Packaging Corp., 2319 S. Sixth St., Columbus 7, Ohio
Pycofoam Corp., P.O. Box 187, Norristown, Pa.
Pyramid Products Co., Inc., The, 3967 E. 93rd St., Cleveland 5, Ohio
Pyro Plastics Corp., Pyro Park, Union, N. J.
Pyrometer Service Co., Inc., 348 River Road, No. Arlington, N. J.
Pyrotex Co., Inc., 287 Whitney St., Leominster, Mass.
Pyroxylin Products, Inc., 4851 S. St. Louis Ave., Chicago 32, Ill.

Q

Quadri Color Co., First Ave. & 57th St., Brooklyn 20, N. Y.
Quality Lithographing Co., Inc., 1101 Zonolite Road, N.E., Atlanta 6, Ga.
Quality Machine Co., 1840 Given Ave., Bronx, N. Y.
Quality Machine Co., 265 W. Washington St., Athens, Ga.
Quality Packaging Supply Corp., 4 E. Forest Ave., Englewood, N. J.
•Quality Park Box Co., Standard Packaging Corp., 2520 Como Ave., St. Paul 8, Minn.
Quantacolor Co., Inc., The, 52 Vanderbilt Ave., New York 17, N. Y.
Quatrum Corp., 127 E. 115th St., Chicago 28, Ill.
Queen City Paper Co., The, 520 Broadway, Cincinnati 2, Ohio
•Queen Transparent Specialties Co., 4637 Fullerton Ave., Chicago 39, Ill.
Queens Envelope Corp., 52-25 Barnett Ave., Long Island City 4, N. Y.
Queens Lithographing Corp., 52-25 Barnett Ave., Long Island City 4, N. Y.
Quelcor, Inc., Front & Broomall Sts., Chester, Pa.
•Quickpak Machinery Corp., 6039 W. Washington Blvd., Culver City, Calif.
Quimby-Walstrom Paper Co., 25-29 Ionia Ave., S.W., Grand Rapids 2, Mich.
Quincy Paper Box Co., 230 N. Third St., Quincy, Ill.
Quinn, Don L., Co., The, 224 W. Kinzie St., Chicago 10, Ill.

R

R. C. Can Co., 9430 Page Ave., St. Louis 32, Mo.
R E B Trays, Inc., 720 Bethlehem Pike, Whitemarsh Township, Flourtown, Pa.
R. & R. Paper Converting Co., 1412 E. 62nd St., Los Angeles 1, Calif.
R-W Paper Co., P.O. Box 39, Longview, Wash.
Rabinowitz, J., & Sons, Inc., 2 Hanson Place, Brooklyn 17, N. Y.
Radiant Color Co., 830 Isabella St., Oakland 11, Calif.
Radiation Applications, Inc., 36-40–37th St., Long Island City 1, N. Y.
Radio Corp. of America, Front & Cooper Sts., Camden 2, N. J.
Radio Frequency Co., Inc., Electron Park, Medfield, Mass.
Radio Frequency Laboratories, Inc., Powerville Rd., Boonton, N. J.
Rafco Plastics, Inc., 48-58 Oak St., Clifton, N. J.
Raffi & Swanson, Inc., 100 Eames St., Wilmington, Mass.
Raible, J. R., Co., The, 205 S. 32nd St., Birmingham 9, Ala.

Rainbow Packaging Co., Inc., 438 E. 102nd St., New York 29, N. Y.
Rainbow Ribbons & Fabrics, Inc., 404 E. 108th St., New York 29, N. Y.
Rainville Co., Inc. of New England, West View Drive, Woodstock, Conn.
Raisin, John T., Corp., 1575 Bayshore Blvd., San Francisco 24, Calif.
Ralston, W., & Co., Inc., W. 177th St. & Harlem River, New York 53, N. Y.
Ralston, W., & Co., (Canada) Ltd., 455 Cote Vertu Road, Montreal 9, Que., Canada
Ram Plastics, Inc., 1255 Westlake Ave., N., Seattle 9, Wash.
Ranburn Co., Inc., The, 112 Killewald St., Tonawanda, N. Y.
Rand Avery-Gordon Taylor, Inc., 871 Commonwealth Ave., Boston 15, Mass.
Rand, Paul, Inc., Goodhill Road, Weston, Conn.
Randall Duster Corp., 56 Aspinwall Road, Briarcliff Manor, N. Y.
Randolph Box & Label Co., 843 W. Van Buren St., Chicago 7, Ill.
Randolph Paper Box Co., Div. Albemarle Paper Mfg. Co., P.O. Box 583, Richmond 5, Va.
Randolph Products Co., Twelfth St., Carlstadt, N. J.
Rap Industries, Inc., 150–26th Ave., S.E., Minneapolis 14, Minn.
Rapid Manufacturing Co., Inc., 1720-24 E. Ohio St., Pittsburgh 12, Pa.
Rapid Mounting & Finishing Co., 310 W. Polk St., Chicago 7, Ill.
Rapid Roller Co., 2558 S. Federal St., Chicago 16, Ill.
Rapid-Pak, Inc., 3538 Emery St., Los Angeles 23, Calif.
Rapids-Standard Co., Inc., The, 850 Rapistan Bldg., Grand Rapids 2, Mich.
Rapistan Canada Ltd., 888 Dupont St., Toronto 4, Ont., Canada
Rapp Packaging Div., Triangle Package Machinery Co., 5723 Ninth Ave., Los Angeles, Calif.
Rappaport, S., Inc., 155 Avenue D, New York 9, N. Y.
Raritan Plastics Corp., 1 Raritan Rd., Oakland, N. J.
Rasmussen & Nilsson A/S, 32, Solvgade, Copenhagen, Denmark
Rathbone, Hair & Ridgeway Box Co., 1440 W. 21st Place, Chicago 8, Ill.
Rathbun & Bird Co., Inc., The, 379 West Broadway, New York 12, N. Y.
Rathbun Molding Corp., 290 Rochester St., Salamanca, N. Y.
Rau Rubber Engraving Co., 260 Hudson St., Hackensack, N. J.
Ravenware Co., Inc., The, 360 Scholes St., Brooklyn 6, N. Y.
Ray Paper Box, Inc., 1052 Harrison St., Conway, Ark.
Raymond Bag Corp., Div. Albemarle Paper Mfg. Co., Enoch Drive, Middletown, Ohio
Reading Corrugated Div., Interstate Container Corp., Grace & Meade Sts., Reading, Pa.
Reading Paper Box Co., Reading, Pa.
Re Bo Manufacturing Co., 355 Park Ave., Newark 7, N. J.
Record Chemical Co., Inc., 840 Montee de Liesse Rd., Montreal, Que., Canada
•Redington Div., Crompton & Knowles Packaging Corp., 3000 St. Charles Road, Bellwood, Ill.
Redmond-Dobard Corp., 2832 Marais St., New Orleans 17, La.
Redram Chemical Co., Inc., 755 Utica Ave., Brooklyn 3, N. Y.
Reed Glass Co., Inc., 860 Maple St., Rochester 19, N. Y.
Reed-Prentice Div., Package Machinery Co., East Longmeadow, Mass.
Reeve Electronics, Inc., 609 W. Lake St., Chicago 6, Ill.
Reeves Brothers, Inc., 1071 Sixth Ave., New York 18, N. Y.
Reeves Pulley Co., Div. Reliance Electric & Engineering Co., 1225 Seventh St., Columbus, Ind.
Regal Chemical Corp., 115 Dobbin St., Brooklyn 22, N. Y.
Regal Plastic Supply Co., 828 Wilson St., Shreveport, La.
Regency Plastics, Inc., 26-44 Borough Place, Woodside 77, N. Y.
Regent Paper Box Co., Frankford & Torresdale Aves., Philadelphia 24, Pa.
Regent Specialties, Div. Angle Genessee Corp., 107 Norris Drive, Rochester 10, N. Y.
Regent Tube & Bag Co., 39 E. 20th St., New York 3, N. Y.
Reich, Erich M., Inc., 83-26 Victor Ave., Elmhurst 73, N. Y.
Reichel & Drews, Inc., 452 N. Ashland Ave., Chicago 22, Ill.
Reilly Tar & Chemical Corp., 1615 Merchant Bank Bldg., Indianapolis 4, Ind.
Reinecke & Associates, 155 E. Ohio St., Chicago 11, Ill.
Reinhold-Gould, Inc., 535 Fifth Ave., New York 17, N. Y.
Reliable Textile Co., P.O. Box 5068, Chicago 80, Ill.
Reliance Paper Box Co., 1720 N. Fifth St., Philadelphia 22, Pa.
Reliance Plastic & Chemical Corp., 112 Kearny St., Paterson 26, N. J.
Remo, Michael, & Co., Inc., 60 W. 46th St., New York 36, N. Y.
Renka Bagmachines Establishment, Oranje Nassaulaan 30, Amsterdam Z, Holland
Repro Design & Equipment Co., Inc., 1310 E. Elizabeth Ave., Linden, N. J.
Republic Container Corp., 1561 Hudson Blvd., Jersey City 5, N. J.
Republic Foil, Inc., 55 Triangle St., Danbury, Conn.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio
Republic Steel Corp., Container Div., 465 Walnut St., Niles, Ohio
Research Sales, Inc., P.O. Box 358, Suffern, N. Y.
•Resina Automatic Machinery Co., Inc., 572 Smith St., Brooklyn 31, N. Y.
Resisto Chemical, Inc., P.O. Box 1945, Wilmington 99, Del.
Resistoflex Corp., Woodland Road, Roseland, N. J.
Resnick, L., & Sons, 31st & Oxford Sts., Philadelphia 21, Pa.
Reutlinger, R. M., & Associates, Inc., 120 W. Second St., Dayton 2, Ohio
Revere Copper & Brass, Inc., 230 Park Ave., New York 17, N. Y.
Revere Copper & Brass, Inc., Revere Ware Foil Container Div., 2200 N. Natchez Ave., Chicago 35, Ill.
Revolvator Co., 2024–86th St., No. Bergen 1, N. J.
Rex Packaging Machine Co., 30 Minna St., Rahway 1, N. J.
Rex Specialty Bag Corp., 21-09 Borden Ave., Long Island City 1, N. Y.
Rexall Drug & Chemical Co. Chippewa Plastics Co., Div., 1701 First Ave., Chippewa Falls, Wis. Film Div., Paramus, N. J.
Rexford Paper Co., 3100 W. Mill Road, Milwaukee 9, Wis.
Reyburn Mfg. Co., Inc., The, 16th St. & Indiana Ave., Philadelphia 32, Pa.
Reynolds Chemical Products Co., 435 W. Eight Mile Road, Whitmore Lake, Mich.
Reynolds Ink, Inc., 2075 E. 65th St., Cleveland 3, Ohio
•Reynolds Metals Co., 6601 W. Broad St., Richmond 18, Va.
Reynolds, Walter J., Co., 3839 S.W. Multnomah Blvd., Portland 19, Ore.
Rheem Mfg. Co., 1701 W. Edgar Rd., Linden, N. J.
•Rhinelander Paper Co., Div. St. Regis Paper Co., 515 W. Davenport St., Rhinelander, Wis.
Rhoades Paper Box Corp., 66 St. John Place, Springfield, Ohio
Richards, Harper, 160 E. Superior St., Chicago, Ill.
Richards, J. A., Co., 903 N. Pitcher St., Kalamazoo, Mich.
Richards, Parents & Murray, Inc., 312 Seventh Ave., New York 1, N. Y.
Richardson Agencies Ltd., 1723A Bayview Ave., Toronto 17, Ont., Canada
Richardson Co., The, 2695 Lake St., Melrose Park, Ill.
Richardson Scale Co., 668 Van Houten Ave., Clifton, N. J.
•Richardson Taylor-Globe Corp., The, 4501 W. Mitchell Ave., Cincinnati 32, Ohio
Richford Corp., 3618 Oceanside Road, Oceanside, N. Y.
Richman, Mel, Design Associates, 15 N. Presidential Blvd., Bala-Cynwyd, Pa.
Richmond Paper Co., 27427 Pacific Ave., Highland, Calif.
Richter, Frederic A., 5520 S. Shore Drive, Chicago 37, Ill.
Rie, John L., Inc., 196 Ashburton Ave., Yonkers, N. Y.
•Riegel Paper Corp., 260 Madison Ave., New York 16, N. Y.
Rieke Metal Products Corp., W. Seventh St., Auburn, Ind.
Riekes Equipment Co., 2910 Cuming St., Omaha 31, Neb.
Riley & Downer, Inc., 26 N. Center St., Orange, N. J.
•Risdon Manufacturing Co., Box 520, Naugatuck, Conn.
Ritchie, W. C., Div., Stone Container Corp., 8801 S. Baltimore Ave., Chicago 17, Ill.
River Raisin Paper Co., Div. Union Bag-Camp Paper Corp., 1109 E. Elm Ave., Monroe, Mich.
Robco Plastics Co., 12-22–30th Ave., Astoria 2, N. Y.
Robeco Chemicals, Inc., 25 E. 26th St., New York 10, N. Y.
Robert Corp., 240 Canal St., Lawrence, Mass.
Roberts Development Corp., Hanover, Mass.
Roberts, Lewis, Inc., 72 Union St., Newark 5, N. J.
Roberts Paper Co., Inc., 41-43 Bassett St., Providence 3, R. I.
Roberts Patent Filling Machine Co., Ltd., 35 Deane Road, Bolton, Lancs., England
Robertshaw-Fulton Controls Co., Greensburg, Pa.
Robertson Co., 93-08–95th Ave., Jamaica 16, N. Y.
Robertson Co., 1301 W. Kentucky St., Louisville 11, Ky.
Robertson Paper Box Co., Inc., Montville, Conn.
Robins, A. K., & Co., Inc., 713 E. Lombard St., Baltimore 2, Md.
Robins Engineering Co., Inc., 208 Maple Ave., No. Haven, Conn.
Robins, Seymour, Inc., 24 W. 45th St., New York 36, N. Y.
Robinson Clay Product Co., The, 65 W. State St., Akron 9, Ohio
Robinson, E. S. & A., (Canada) Ltd., 69 Laird Drive, Leaside, Ont., Canada
Robinson Industries, Inc., 3051 Curtice Road, Coleman, Mich.
Robinson Laboratories, Inc., 1108 Eastern Ave., Cincinnati 2, Ohio

Robinson Plastics Corp., 132 Lafayette St., New York 13, N. Y.
Robinson Tag & Label Co., 460 W. 34th St., New York 1, N. Y.
Robinson Waxed Paper Co., Ltd., The, Victoria House, Southampton Row, London, W.C. 2, England
Robles Packaging Corp., 11 W. 30th St., New York 1, N. Y.
Robroyce Co., Inc., The, 25 Amity St., Singac, N. J.
Rochester Lithograph Mfg. Corp., 1776 Clinton Ave. N., Rochester 3, N. Y.
Rock Manufacturing Co., 1779 Central St., Stoughton, Mass.
Rockford Molded Products, Inc., 2230 Kishwaukee St., Rockford, Ill.
Rockford Package & Container Corp., 1916 Eleventh St., Rockford, Ill.
Rockport Machine & Tool Co., 1386 Park Row, Cleveland 7, Ohio
Rocky Mountain Steel Products, Inc., 1360 Wall St., Los Angeles 15, Calif.
Roda, Fratelli, S. A., Viganello/Lugano, Switzerland
Roddis Plywood Corp., Marshfield, Wis.
Rodgers, George G., New Equipment Div., Brill Equipment Co., 2401 Third Ave., New York 51, N. Y.
Rodgers Packaging, 49 W. 32nd St., New York 1, N. Y.
Rodney, Jim, Co., 503 Curtis Bldg., Detroit 2, Mich.
Roehlen Engraving Works, 701 Jefferson Rd., Rochester 2, N. Y.
Roesch, Louis, Co., 1886 Mission St., San Francisco 3, Calif.
Rogers, Paul, Associates, 267 Tappan Road, Norwood, N. J.
Rogers Printing & Carton Co., 1540 Russell St., Baltimore 30, Md.
Rogers, V. F., 4320 Fox St., Denver 16, Colo.
Rohm & Haas Co., Washington Square, Philadelphia 5, Pa.
Roll Label Mfrs. Assn., 1405 K St., N.W., Washington 5, D. C.
Roller Engraving Co., 36-12—48th Ave., Long Island City 1, N. Y.
Roll-On Sealer Co., 362 Depot St., Antioch, Ill.
Roll-O-Sheets, Inc., 9444 Watson Industrial Park, St. Louis 26, Mo.
Rollprint Products Corp., 2301 Wabansia Ave., Chicago 47, Ill.
Roma Adhesives, Inc., 900 Passaic Ave., E. Newark, N. J.
Romar "Skin-Pack," Inc., 366 Butler St., Brooklyn 17, N. Y.
Rome Plastic Specialties, Inc., 43 Oxford St., Worcester 9, Mass.
•Rondo of America, Inc., 100 Sanford St., Hamden 14, Conn.
Rondout Corp., 41 E. 42nd St., New York 17, N. Y.
Ronor Corp., The, Div. The Engine Parts Mfg. Co., 1360 W. Ninth St., Cleveland 13, Ohio
Rose Brothers (Gainsborough) Ltd., Albion Works, Gainsborough, Lancs., England
Rose Color, Inc., 6 Varick St., New York 13, N. Y.
Rose, Gene, Co., Inc., 1637 S. Kilbourn Ave., Chicago 23, Ill.
Rose Hill Lithographers, Inc., 601 W. 26th St., New York 1, N. Y.
Rosebud Mfg. Corp., 874 Broadway, New York 3, N. Y.
Rosedale, T., 116 Broad St., New York 4, N. Y.
Rosen, Ben, 10 E. 53rd St., New York 22, N. Y.
Rosen, Cele, Studio, 737 N. Michigan Ave., Chicago 11, Ill.
Rosenthal Bros. Cords & Tassels, Inc., 47-05 Fifth St., Long Island City 1, N. Y.
Rosenthal Mfg. Co., 5033 N. Kedzie Ave., Chicago 25, Ill.
Rosenthal Paper Products Co., 200 Lynch St., St. Louis 18, Mo.
Rosner Supply Co., Lena, Wis.
Rospond, Jan, Design Studio, 344 Shunpike Road, Chatham, N. J.
Ross Container & Seal Co., 280 Broadway, New York 7, N. Y.
Ross & Roberts, Inc., 1299 W. Broad St., Stratford, Conn.
Rossotti Lithograph Corp., 8511 Tonnelle Ave., No. Bergen, N. J.
Rotary Imprinter, Inc., P.O. Box 31, Hillside 5, N. J.
Rothchild Printing Co., Inc., 52 E. 19th St., New York 3, N. Y.
Roto Bag Machine Corp., 130 E. 13th St., New York 3, N. Y.
•Roto Cylinders, Inc., 701 Public Road, Palmyra, N. J.
Rotogravure Packaging, Inc., 90 Church St., Addison, Ill.
Rotogravure Service Co., 6441 N. Ridge Blvd., Chicago 26, Ill.
Roto-Lith, Ltd., 30 W. 13th St., New York 11, N. Y.
Roto-Type Corp., 38-32—54th St., Woodside 77, N. Y.
Roto Wrap Machine Corp., 241 William St., Englewood, N. J.
Round Tubes & Cores Co., 806 N. Peoria St., Chicago 22, Ill.
Roura Iron Works, Inc., 1401 Woodland Ave., Detroit 11, Mich.
Rowe, C. L., Corp., Rt. 17 & Meadow Rd., Rutherford, N. J.
Rowell, E. N., Co., Inc., Ellicott St., Batavia, N. Y.
Rowland, E. W., Associates, 110 Washington St., New York 6, N. Y.
Royal Container Co., 629 Bryant St., San Francisco 7, Calif.
•Royal Lace Div., Standard Packaging Corp., Box 210, Baer Field, Fort Wayne, Ind.
Royal Mfg. Co., Inc., Sub. Celanese Corp. of America, 744 Broad St., Newark, N. J.
Royal Packaging Equipment, Inc., 1406 Bergen Blvd., Fort Lee, N. J.
Royal Paper Box Co., 960 E. 61st St., Los Angeles 1, Calif.
Royal Paper Corp., 210 Eleventh Ave., New York 1, N. Y.
Royal-Pioneer Paper Box Mfg. Co., Inc., Aramingo & Castor Aves., Philadelphia 34, Pa.
•Royal Zenith Corp., 180 Varick St., New York 14, N. Y.
Royce Bag Mfg. Corp., 606 Bergen St., Brooklyn 38, N. Y.
Royce, Clint, Inc., Box 125, Little Silver, N. J.
Royle, John, & Sons, 10 Essex St., Paterson 3, N. J.
Rubba, Inc., 1015 E. 173rd St., New York 60, N. Y.
Rubber & Asbestos Corp., 225 Belleville Ave., Bloomfield, N. J.
Rubber Corp. of America, New South Rd., Hicksville, N. Y.
Ruberoid Co., The., Safepak Mills Div., 733 Third Ave., New York 17, N. Y.
Rubin, Jack, Box Co., 1910 Elston Ave., Chicago 22, Ill.
Rubner, Gustave, Corp., 5925 Broadway, New York, N. Y.
Rucker Co., The, 4700 San Pablo Ave., Oakland 8, Calif.
Rupaco Paper Corp., 62 Fourth St., Brooklyn 31, N. Y.
Rutherford Machinery Co., Div. Sun Chemical Corp., 401 Central Ave., East Rutherford, N. J.
Rway Synthetic Products Div., Reiss Mfg. Corp., 107 Fourth Ave., New York 3, N. Y.

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SH&L, 130 E. 59th St., New York 22, N. Y.
S-L-M Plastics, 420 Park Ave., Perth Amboy, N. J.
S & S Corrugated Paper Machinery Co., Inc., 160 N. Fourth St., Brooklyn 11, N. Y.
Sackett, DeForest, & Assoc., Inc., 200 S. Michigan Ave., Chicago 4, Ill.
Saco, Ken, Associates, Inc., 1 Rockefeller Plaza, New York 20, N. Y.
Safelon Corp., 167 Saw Mill River Rd., Yonkers, N. Y.
Saga Packaging Machinery Div., A & M Tool & Die Co., Inc., Mill St., Southbridge, Mass.
Sage Equipment Co., Inc., 30 Essex St., Buffalo 13, N. Y.
Sager Bros., 133 W. 24th St., New York 11, N. Y.
St. Clair Specialty Mfg. Co., 120 S. 25th Ave., Bellwood, Ill.
St. Joe Paper Co., 1524 Barnett Bank Bldg., Jacksonville 2, Fla.
St. Joe Paper Co., Houston Container Div., 1300 N. Post Oak Rd., Houston 24, Texas
St. Lawrence Corp., Ltd., 840 Sun Life Bldg., Montreal 2, Que., Canada
St. Louis Lithographing Co., 6801 South Broadway, St. Louis 11, Mo.
St. Regis Paper Co.
General Offices, 150 E. 42nd St., New York 17, N. Y.
Ajax Box Co., Div., 2210 S. Union Ave., Chicago 16, Ill.
Carton Craftsmen Div., 5701 W. Ogden St., Cicero 50, Ill.
Central Waxed Paper Co., Div., 5100 W. Roosevelt Rd., Chicago 50, Ill.
Cornell Paperboard Products Co., Div., 1514 E. Thomas Ave., Milwaukee 1, Wis.
Crowell Carton Div., Marshall, Mich.
Dubuque Container Div., Brunswick Block, Dubuque, Iowa
Great Lakes Box Co., Div., 7275 Wentworth Ave., Cleveland, Ohio
Gulf Carton Div., P.O. Box 486, Pensacola, Fla.
Gummed Products Co., Div., 421 S. Union St., Troy, Ohio
Niagara Corrugated Container Div., 1110 Military Road, Buffalo 22, N. Y.
Nifty Mfg. Div., 2110 S. Fifth Ave., Birmingham 3, Ala.
Panelyte Div., Cambridge, Ohio
Pollock Paper Co., Div., 2236 Cockrell St., Dallas 22, Texas
•Rhinelander Paper Co., Div., 515 W. Davenport St., Rhinelander, Wis.
Schmidt & Ault Paper Co., Div., 423 King's Mill Road, York, Pa.
Sherman Paper Products Co., Div., 156 Oak St., Newton Upper Falls 64, Mass.
Superior Paper Products Co., Sub., Box 4449, Pittsburgh 5, Pa.
Sakier, George, 340 E. 71st St., New York 22, N. Y.
Salem Label Co., Inc., 838 S. Lundy Ave., Salem, Ohio
Sales Equipment & Packaging Corp., 370 Seventh Ave., New York 1, N. Y.
Salser Engineering Co., Inc., 2207 Butler St., Dallas 35, Texas
Salwasser Manufacturing Co., P.O. Box 548, Reedley, Calif.
Salwen, Joe, Paper Products Corp., 185 Randolph St., Brooklyn 37, N. Y.
Salwen Paper Co., Inc., 1 Rewe St., Brooklyn 11, N. Y.
Samida Sales Co., Inc., P.O. Box 194, Chicago 17, Ill.

Sample-Durick Co., Inc., P.O. Box 389, Chicopee, Mass.
Sampson, C. C., & Associates, 69 Water St., San Francisco 11, Calif.
Samson Plastic Products Co., 2444 W. Washington Blvd., Los Angeles 18, Calif.
Samuels Products, Inc., Broadway & Commercial Square, Cincinnati 2, Ohio
San Diego Paper Box Co., 1924 Adams Ave., San Diego, Calif.
San Jose Paper Box Co., 1021 Richard Ave., Santa Clara, Calif.
Sandusky Folding Box Corp., 607 King St., Sandusky, Ohio
Sandvik Steel, Inc., Conveyor Div., 1702 Nevins Rd., Fair Lawn, N. J.
Sanford, H. C., Associates, 343 Lexington Ave., New York 16, N. Y.
Sanford Plastics, Div. Bonny Mfg. Corp., 146 Main St., Maynard, Mass.
•Sanford, William B., Inc., 601 W. 26th St., New York 1, N. Y.
Saniwax Paper Co., 436 N. Park St., Kalamazoo 11, Mich.
Sanpack Ges. Lambsdorff & Co., Hamburg 48, Germany
Santa Barbara Instrumentation Corp., Bldg. 116, Santa Barbara Airport, Goleta, Calif.
Saphier, Michael, Associates, Inc., 488 Madison Ave., New York 22, N. Y.
Saranac Machine Co., 376 W. Main St., Benton Harbor, Mich.
Sauer Cooperage Co., 346 Goodell St., Wyandotte, Mich.
Sauter, C. Albert, Co., Water & Jackson Sts., Philadelphia, Pa.
Sayford Corp., Goshen Rd., Litchfield, Conn.
Scale Specialties, Inc., P.O. Box 574, Denville, N. J.
•Scandia Packaging Machinery Co., 500 Belleville Turnpike, No. Arlington, N. J.
Scarmar Mfg. Co., 102-106 Straight St., Paterson 1, N. J.
Schaefer Machine Co., Inc., 14[illegible] Front St., Bridgeport 6, Conn.
Schaefer Machine Co., Inc., 100 White St., Brooklyn 6, N. Y.
Schaper, W. H., Mfg. Co., Inc., 650 Ottawa Ave., N., Minneapolis 22, Minn.
Scheele, Edwin H., 53-30 Skillman Ave., Woodside 77, N. Y.
Schenker Co., The, 2301 Wabansia Ave., Chicago 47, Ill.
Scherer, R. P., Corp., 9425 Grinnell Ave., Detroit 13, Mich.
Schiefer Folding Box Corp., 801 W. Fayette St., Syracuse 4, N. Y.
Schiffenhaus Bros., 2013 McCarter Highway, Newark 4, N. J.
Schiffer-Sussman & Co., 300 E. Third St., New York 9, N. Y.
Schjeldahl, G. T., Co., 204-206 Division St., Northfield, Minn.
Schladermundt, Peter, Associates, 205 E. 42nd St., New York 17, N. Y.
Schleicher, F. J., Paper Box Co., 1811 Chouteau Ave., St. Louis 3, Mo.
Schmidt & Ault Paper Co., Div. St. Regis Paper Co., 423 King's Mill Road, York, Pa.
Schmidt, Henry, & Bro., Inc., 875 N. 28th St., Philadelphia 30, Pa.
Schmidt Lithograph Co., 461 Second St., San Francisco 7, Calif.
Schmitt, Charles J., Co., Inc., 25th & Indiana St., San Francisco 7, Calif.
Schmitz, Henry A., Inc., 261 Milton Ave., Ballston Spa, N. Y.
Schmutz Mfg. Co., Inc., 1600 W. Main St., Louisville 3, Ky.
Schneider Engineering & Products Co., 3592 N.W. 52nd St., Miami, Fla.
Schneiders', Willy, Maschinenfabrik, P.O. Box 18, Berlin N. 20, Germany
Schnellpressenfabrik AG Heidelberg, 17-21 Eppelheimerstrasse, Heidelberg, Germany
Schnier, I. F., Co., Inc., 683 Bryant St., San Francisco 7, Calif.
Schnur & Appel, 87 Woodland Rd., Short Hills, N. J.
Schoettle, Edwin J., Co., Inc., 500 Church Road, No. Wales, Pa.
Schrader's, A., Son, Div. Scovill Mfg., Inc., 470 Vanderbilt Ave., Brooklyn 38, N. Y.
Schreiter, F. R., Inc., 179 Brook St., Clinton, Mass.
Schroeder, Arthur, Paper Co., Inc., 420 Lexington Ave., New York 17, N. Y.
Schroeder Machines Corp., New Court Ave., East Syracuse, N. Y.
Schroeder-McKey Co., 4340 N. 127th St., Milwaukee 18, Wis.
Schrom, Archie M., & Co., 461 E. Ohio St., Chicago 11, Ill.
Schulman, Frank, Paper Co., 432 Fourth Ave., New York 16, N. Y.
Schultz Engineering Corp., 190 Banker St., Brooklyn 22, N. Y.
Schulz, A. Geo., Co., 433 W. Clybourn St., Milwaukee 1, Wis.
Schuman, Harold, Studio, 359 Boylston St., Boston 16, Mass.
Schutz Bros., 152 Chambers St., New York 7, N. Y.
Schwartz Chemical Co., Inc., 50-01 Second St., Long Island City 1, N. Y.
Schwartz, M., Associates, 69 Lincoln Park, Newark 2, N. J.
Schwarz, Norbert F., Studio, 49 E. Oak St., Chicago 11, Ill.
Schweitzer, Peter J., Div., Kimberly-Clark Corp., 261 Madison Ave., New York 16, N. Y.
Scientific Filter Co., 56A Rose St., New York 38, N. Y.
Scott & Daniells, Inc., Freestone Ave., Portland, Conn.
Scott & McDonald, Inc., 108 E. Dedham St., Boston 18, Mass.
•Scott Paper Co., Hollingsworth & Whitney Div., International Airport, Philadelphia 13, Pa.
Scott Plastics Corp., 410 Windsor St., Hartford 5, Conn.
Scovill Manufacturing Co., 99 Mill St., Waterbury 20, Conn.
Scranton Corrugated Box Co., Inc., 301 Green Ridge St., Scranton, Pa.
Screen Process Printing Assn., 549 W. Randolph St., Chicago 6, Ill.
Screenmasters, 128–32nd St., Brooklyn 32, N. Y.
Sculptural Promotions, Inc., 441 Lexington Ave., New York 17, N. Y.
Seaboard Lithograph Corp., 37 E. 18th St., New York 3, N. Y.
Seaboard Manufacturing Laboratories, Inc., Water & Mifflin Sts., Philadelphia 48, Pa.
Seal Bag Co., Inc., 37 Charlotte St., Rochester 7, N. Y.
Sealaround Corp., 2024 S. Wabash Ave., Chicago 16, Ill.
Sealcraft Products Corp., 7330 N. Teutonia, Milwaukee 9, Wis.
Seal-O-Matic Dispenser Co., 169 Murray St., Newark 5, N. J.
•Sealomatic Electronics Corp., 38 W. 32nd St., New York 1, N. Y.
Seal-Peel, Inc., 775 Stephenson Hwy., Royal Oak 3, Mich.
Sealright Co., Inc., 314 S. First St., Fulton, N. Y.
Seal-Spout Corp., 230 Sheffield St., Mountainside, N. J.
Sealy Plastics Corp., P.O. Box 89, Rockville, Conn.
Seaman Paper Co., 1236 Sherman Ave., Evanston, Ill.
Seamless Rubber Co., The, 464 Congress Ave., New Haven 3, Conn.
Seaquist Mfg. Corp., First St., Cary, Ill.
Sears, Merle, Paper Box Co., 1024 Industrial Ave., Danville, Ill.
Seasongood Folding Box Co., P.O. Box 85, Harrison, Ohio
Seattle Box Co., 401 Spokane St., Seattle 4, Wash.
Seaward-Edison Corp., 150 Lafayette St., New York 13, N. Y.
Security Carton Co., Crichton Station, Mobile, Ala.
Security Lithograph Co., Label Div., 200 Broadway, San Francisco 11, Calif.
Sefton Fibre Can Div., Container Corp. of America, 3275 Big Bend Blvd., St. Louis 17, Mo.
Seiberling Rubber Co., Plastics Div., Newcomerstown, Ohio
Selame, Joe, Design Assoc., 57 Cross St., West Newton 65, Mass.
Select Pallet Co., 4085 Sheila St., Los Angeles 23, Calif.
Sema Plastic Products Corp., 65-50 Austin St., Rego Park 74, N. Y.
Semper Paper Co., Inc., 167 S. Fifth St., Brooklyn 11, N. Y.
Seneca Wire & Mfg. Co., S. Vine St., Fostoria, Ohio
Sensory, Inc., 7 Maple Ave., Morristown, N. J.
Sentinel Bag & Paper Co., Inc., 219–36th St., Brooklyn 32, N. Y.
Sentry Products Co., 70 Von Hillern St., Boston 25, Mass.
Seri-Print, Inc., 205 Cherry St., Waterbury, Conn.
Service Engineers, Inc., 3030 W. Pafford St., Fort Worth 9, Texas
Service Folding Box Co., Inc., 55 E. 28th St., Brooklyn 26, N. Y.
Service Industries, 2103-07 E. Somerset St., Philadelphia 34, Pa.
Service Paper Box Co., 2500 W. Broadway, St. Louis 6, Mo.
Servon, Inc., 116 Broad St., New York 4, N. Y.
Seymour of Sycamore, Inc., 220 Lucas St., Sycamore, Ill.
Seymour & Peck Div., The Greif Bros. Cooperage Corp., 2341 W. 135th Place, Blue Island, Ill.
Shadur Box Co., 5110 N. 35th St., Milwaukee 9, Wis.
Shamban, W. S., & Co., 11617 W. Jefferson Blvd., Culver City, Calif.
Shampain, Citron, Clark, Inc., 856 Magnolia Ave., Elizabeth, N. J.
Shamrock Paper Co., 300 Lynch St., St. Louis 18, Mo.
Shannon, Alexander J., Co., The, Route 5, Fonda, N. Y.
Shannon Industries, Inc., Box 510, Glen Cove, N. Y.
Shargel Advertising & Art Assoc., P.O. Box 1202, Perry Annex, Whittier, Calif.
Shasta Manufacturing Co., 276 Snyder Ave., Berkeley Heights, N. J.
Shaw, Frank, Co., 711 S. Vermont St., Los Angeles 5, Calif.
Shaw Insulator Co., 276 Snyder Ave., Berkeley Heights, N. J.
Shaw Paper Box Co., 37 Sabin St., Pawtucket, R. I.
Shawano Paper Mills, Shawano, Wis.
Shawinigan Resins Corp., 644 Monsanto Ave., Springfield 1, Mass.
Shawmut Waxed Paper Co., Railroad St., Holliston 2, Mass.
Shaw-Randall Co., Inc., 39 Sabin St., Pawtucket, R. I.
Shayn, John, Studio, 62 W. 46th St., New York 36, N. Y.
Shear-Prinz Associates, 1139 S. Wabash Ave., Chicago 5, Ill.
Sheboygan Paper Box Co., 716 Clara Ave., Sheboygan, Wis.

Sheffield Tube Corp., The, 170 Broad St., New London, Conn.
Shelby Paper Box Co., The, 4081 W. 150th St., Cleveland 35, Ohio
Sheldon Wood Products, Box 338, Toano, Va.
Shell Chemical Co., Plastics & Resins Div., 110 W. 51st St., New York 20, N. Y.
•Shelly Div., Standard Packaging Corp., 121 Elm St., Farmington, Minn.
Shelly, W. B., & Co., 36 St. Andrew Gardens, Toronto 5, Ont., Canada
Shelton Mfg. Co., Inc., 591 Ferry St., Newark 5, N. J.
Sheppard Envelope Co., 1 Envelope Terrace, Worcester 4, Mass.
Sherman Paper Products Co., Div. St. Regis Paper Co., 156 Oak St., Newton Upper Falls 64, Mass.
Sherwin-Williams Co., The, Pigment, Color & Chemical Div., 260 Madison Ave., New York 16, N. Y.
Shield Chemical Co., Inc., 1687 Hyde Park Ave., Hyde Park 36, Mass.
Shields, Inc., 401 Fifth Ave., New York 16, N. Y.
Shields & Raymond, Box 711, Old Greenwich, Conn.
Shillington Box & Lumber Co., 200 Chouteau Ave., St. Louis 18, Mo.
Shoe Form Co., Inc., 26 Aurelius Ave., Auburn, N. Y.
Shopsin Paper Co., 92 Vandam St., New York 13, N. Y.
Shore Line Industries, Inc., 1 Railroad Ave., Clinton, Conn.
Shore, R. W., Mfg. Co., Inc., 33-17–37th Ave., Long Island City 1, N. Y.
Shoup-Owens, Inc., 1100 Adams St., Hoboken, N. J.
Show-Pak, Inc., 1390 E. 34th St., Cleveland 14, Ohio
Shredded Paper Products Co., 6-8 S. Schroeder St., Baltimore 23, Md.
Shredmaster Corp., The, 384 Woodcleft Ave., Freeport, N. Y.
Shuford Mills, Inc., P.O. Drawer 340, Hickory, N. C.
Shuman, Frank G., Co., The, 600 W. Jackson Blvd., Chicago 6, Ill.
Shumann Equipment Co., 647 W. Magnolia Ave., Louisville, Ky.
Shuttleworth Carton Co., 474 West Broadway, New York, N. Y.
Shuttleworth, Inc., P.O. Box 8, Warren, Ind.
Siax Industries, Inc., Newton Highlands, Mass.
Sidney Paper Box Co., 700 E. Main St., Blanchester, Ohio
Sierad, Albert E., Co., Inc., 625 Waverly Ave., Mamaroneck, N. Y.
Signode Steel Strapping Co., 2600 N. Western Ave., Chicago 47, Ill.
Silicone Insulation, Inc., 1383 Seabury Ave., Bronx 61, N. Y.
Silicone Paper Co. of America, Inc., The, 230 Park Ave., New York 17, N. Y.
Silicones Div., Union Carbide Corp., 270 Park Ave., New York 17, N. Y.
Sillcocks-Miller Co., The, 10 W. Parker Ave., Maplewood, N. J.
•Simco Co., The, 920 Walnut St., Lansdale, Pa.
Simkins Paper Box Mfg. Co., Second & Cambria Sts., Philadelphia 33, Pa.
Simon Adhesive Products Corp., 35-02–48th Ave., Long Island City 1, N. Y.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Simplex Paper Box Corp., Janet & Marshall Aves., Lancaster, Pa.
•Simplex Plant, FMC Corp., P. O. Box 7095, Fruitvale Sta., Oakland, Calif.
Simplex Plastic Products, Inc., 3611–14th Ave., Brooklyn 18, N. Y.
Simpson Box & Lumber Co., 1290 Mt. Read Blvd., Rochester, N. Y.
Sinclair & Valentine Co., Printing Ink Div., American-Marietta Co., 611 W. 129th St., New York 27, N. Y.
Singer, Lawrence H., 18 E. 48th St., New York 17, N. Y.
Singer Sewing Machine Co., 149 Broadway, New York 6, N. Y.
Sirco Mfg. Corp., 525 Broadway, New York 12, N. Y.
Skarnes Engineering & Supply, Inc., 2907 E. Franklin Ave., Minneapolis 6, Minn.
Skill-Craft, Inc., 363 Northeast Ave., Tallmadge, Ohio
Skolnik Drum Co., 4600 W. 48th St., Chicago, Ill.
Slater Bros. Co., Inc., The, 80 William St., New York 38, N. Y.
Sleight & Hellmuth Co., 900 S. Clinton St., Chicago 7, Ill.
Slick Products, P.O. Box 484, Madison Sq. Station, New York 10, N. Y.
•Slick Shine Co., The, 207-15 Astor St., Newark 5, N. J.
Slide-Top Packaging, Inc., 1724 W. Indiana Ave., Philadelphia 32, Pa.
Sloan Folding Box Corp., 59 Halstead Ave., Buffalo 12, N. Y.
Sloan, Francis J., 72 Lumae St., Springfield 9, Mass.
Slobodkin, Simon, 1107 Broadway, New York 10, N. Y.
Smeed Box Co., The, 1878 Scranton Rd., Cleveland 13, Ohio
Smico, Inc., 500 N. MacArthur Blvd., Oklahoma City, Okla.
•Smith, H. P., Paper Co., 5001 W. 66th St., Chicago 38, Ill.
Smith, Howard, Paper Mills Ltd., 2300 Sun Life Bldg., Montreal 2, Que., Canada
Smith, J. Chris, Inc., 1512 N. Las Palmas, Hollywood 28, Calif.
Smith, J. E., Co., The, 836 Leadenhall St., Baltimore 30, Md.
Smith-Lee Co., Inc., 537 Fitch St., Oneida, N. Y.
Smith & Lustig, 2165 E. 31st St., Cleveland 15, Ohio
Smith, S. K., Co., The, 2857 N. Western Ave., Chicago 18, Ill.
Smith, Scherr & McDermott, 39 S. Miller Road, Akron 13, Ohio
Smith-Stewart Paper Products, Inc., 10 Jay St., Brooklyn 1, N. Y.
Smith & Tepper Design Associates, 737 Beach St., San Francisco 9, Calif.
Smith & Winchester Mfg. Co., The, So. Windham, Conn.
Smithe, F. L., Machine Co., Inc., 645 W. 44th St., New York 36, N. Y.
Smyth, H. M., Printing Co., 178 E. Ninth St., St. Paul 6, Minn.
•Snell, Foster D., Inc., 29 W. 15th St., New York 11, N. Y.
Snow Craft Co., Inc., 59 E. Second St., Mineola, N. Y.
Snyder & Black & Schlegel, Inc., 415 Knollwood Road, White Plains, N. Y.
Snyder, George H., Inc., 3645 N. Smedley St., Philadelphia 40, Pa.
Snyder, Gilbert, Designers, 254 W. 31st St., New York 1, N. Y.
Soabar Co., 7722 Dungan Road, Philadelphia 11, Pa.
Society of Packaging & Handling Engineers, 14 E. Jackson Blvd., Chicago 4, Ill.
Society of the Plastics Industry, Inc., The, 250 Park Ave., New York 17, N. Y.
Socony Mobil Oil Co., Inc., 150 E. 42nd St., New York 17, N. Y.
Sohn Manufacturing, Inc., West St., Elkhart Lake, Wis.
Solatech Coating Corp., 15 River St., New Rochelle, N. Y.
Solbern Manufacturing Corp., 120–13th St., Brooklyn 15, N. Y.
Solid Fibre Box Group, 224 S. Michigan Ave., Chicago 4, Ill.
Solo Cup Co., 7431 East End Ave., Chicago 49, Ill.
Soltz, M. G., Associates, 369 Lexington Ave., New York 17, N. Y.
Somerville Ltd., P.O. Box 96, London, Ont., Canada
Sonneborn Chemical & Refining Corp., 300 Park Ave. S., New York 10, N. Y.
Sonoco Products Co., Second St., Hartsville, S. C.
Sonorol Laboratories, 1910 Webster Ave., New York 57, N. Y.
Sorel, Frederick, P.O. Box 47, Prospect Heights, Ill.
Sorg Paper Co., The, 901 Manchester Ave., Middletown, Ohio
South Bend Box Co., Div. General Building Materials Corp., 227 West Broadway, South Bend, Ind.
South Bend Wood Parts, Inc., 1344 W. Sample St., South Bend, Ind.
Southall & Smith Ltd., Villa St., Hockley, Birmingham 19, England
Southeastern Packaging Co., 4700–96th St. N., St. Petersburg 8, Fla.
Southern Adhesives Corp., 1501 W. Moore St., Richmond 20, Va.
Southern Box & Crate Assn., 402 Barr Bldg., Washington 6, D. C.
Southern California Plastic Co., 1805 Flower St., Glendale 1, Calif.
Southern Crate & Veneer Co., 755 Lower Poplar Road, Macon, Ga.
Southern Gravure Service, Inc., 2929 S. Floyd St., Louisville 1, Ky.
Southern Industry Sales Co., 1510 Tulip Drive, Arlington, Texas
Southern Lumber & Mfg. Co., Highway #5, Ellijay 3, Ga.
Southern Packaging Service, 658 E. Forsyth St., Jacksonville 2, Fla.
Southern Paper Box Co., 1400 E. 28th St., Little Rock, Ark.
Southern Paper Co., Ltd., 535 Tchoupitoulas St., New Orleans 3, La.
Southern Plastic Products Co., 948 Ave. "E", Riviera Beach, Fla.
Southern Plastics Co., 408 Pendleton St., Columbia 1, S. C.
Southern Special Products, 1510 Webster St., Richmond, Va.
Southern States Containers Div., Reynolds Aluminum Supply Co., 2828 N. Fifth Ave., Birmingham 1, Ala.
Southern Wooden Box, Inc., 1100 E. Johnson Ave., Jonesboro, Ark.
Southline Metal Products Co., 3777 W. 12th St., Houston 24, Texas
Southport Manufacturing Co., 301 Natchez Bldg., New Orleans, La.
Southwestern Controls, P. O. Box 22351, Houston 27, Texas
Southwestern Steel Container Co., Dallas, Texas
Southwick, Charles A., Jr., Millrace House, Hope, N. J.
Sovereign Paper Corp., P.O. Box 398, Suffern, N. Y.
Soyster & Ohrenschall, Inc., 556 Commercial St., San Francisco 11, Calif.
Sparks Corp., The, Shurs Lane & Pechin St., Philadelphia, Pa.
Sparks, J. V., Inc., P.O. Box 367, Paramount, Calif.
Spear Box Co., Inc., 270 Eleventh Ave., New York 1, N. Y.
Spec-Fab Co., Inc., 1818 Rowland St., Riverton, N. J.
Special Bag Mfg. & Labeling Co., 1753 N. Honore St., Chicago 22, Ill.
Special Glass Products Co., 10 W. 33rd St., New York 1, N. Y.
Special Packing Materials Corp., 36 Erie St., Elizabeth, N. J.
Specialized Packaging Engineering Co., 1716 W. McKinley, Phoenix 7, Ariz.

Specialty Automatic Machine Corp., 80 Cambridge St., Burlington, Mass.
Specialty Converters, Inc., 20 Mill Lane, East Braintree 84, Mass.
Specialty Paper & Board Affiliates, Inc., 122 E. 42nd St., New York 17, N. Y.
Specialty Paper Box Co., 6310 Avalon Blvd., Los Angeles 3, Calif.
Specialty Papers Co., The, 802 Miami Chapel Rd., Dayton 8, Ohio
Speedex Equipment Co., 57-11 Roosevelt Ave., Woodside 77, N. Y.
Speedmaster Packaging Corp., 500 W. 52nd St., New York 19, N. Y.
Speedry Chemical Products, Inc., 91-31–121st St., Richmond Hill 18, N. Y.
Speedways Conveyors, Inc., 202 Rhode Island St., Buffalo 13, N. Y.
Speedy Packing Co., 249 W. 18th St., New York 11, N. Y.
Spencer Chemical Co., Dwight Building, Kansas City 5, Mo.
Spenzer Container Corp., Greenville, Pa.
Spielman Co., Inc., 161 Leverington Ave., Philadelphia 27, Pa.
Spilman, Raymond, 120 E. 56th St., New York 22, N. Y.
Spitzer Paper Box Co., The, 3051 Monroe St., Toledo 6, Ohio
Sprapak Chemicals, Inc., 260 Meserole St., Brooklyn 6, N. Y.
Sprayon Products, Inc., 2075 E. 65th St., Cleveland 3, Ohio
Sprayway, Inc., 7644 S. Vincennes Ave., Chicago 20, Ill.
Spring Supply, Inc., 427 N.W. Broadway, Portland 9, Ore.
Spring Wood Products, Inc., Austin Road, Geneva, Ohio
Springfield Cast Products, Worcester, Mass.
Springfield Coated Paper Corp., Ninth & Bailey Sts., Camden 2, N. J.
Springfield Coated Products, Worcester, Mass.
Springman & Wood Co., 523 Harrison St., Passaic, N. J.
Springmeyer Assoc., 216 E. 49th St., New York 17, N. Y.
Sprout, Waldron & Co., Inc., 60 Logan St., Muncy, Pa.
Sprowles & Allen, Inc., York & Jasper Sts., Philadelphia 25, Pa.
Squire-Cogswell Co., 4151 N. Kedzie Ave., Chicago 18, Ill.
Srofe, Jesse, 1632 Carew Tower, Cincinnati 2, Ohio
Staff Die Cutting Co., 40 W. 22nd St., New York 10, N. Y.
Stahl, Gerald, Inc., 605 Fifth Ave., New York 17, N. Y.
Stalfort, John C., & Sons, Inc., 319 W. Pratt St., Baltimore 1, Md.
Standard Bag Co., P.O. Box 1052, Houston 1, Texas
Standard Bag Corp., 29-10 Hunters Point Ave., Long Island City 1, N. Y.
Standard Box Co., 27th St. & A.V.R.R., Pittsburgh 17, Pa.
Standard Can Corp., Ohio River Blvd., Leetsdale, Pa.
Standard Cap & Molding Co., 307 S. Eaton St., Baltimore, Md.
Standard Cap & Seal, Inc., 2161 Irvindale Drive, Chamblee, Ga.
Standard Collapsible Tube Co., Rochester, Pa.
Standard Container, Inc., 484 Bloomfield Ave., Montclair, N. J.
Standard Conveyor Co., 2266 N. Second Ave., No. St. Paul 9, Minn.
Standard Corrugated Case Corp., 686 Grand Ave., Ridgefield, N. J.
Standard Foil Products Corp., 576 St. James Ave., Springfield 9, Mass.
Standard Folding Trays Corp., 85th St. & 24th Ave., Jackson Heights 70, N. Y.
Standard Instrument Corp., 657 Broadway, New York 12, N. Y.
Standard Insulation Co., Inc., 74 Paterson Ave., East Rutherford, N. J.
Standard Metal Products Co., 123 N. Racine, Chicago 7, Ill.
Standard Molding Corp., 1517 E. Third St., Dayton 3, Ohio
Standard Novelty Box Co., Inc., 385 Gerard Ave., New York 51, N. Y.
•Standard Packaging Corp.
General Offices, 200 E. 42nd St., New York 17, N. Y.
•Allegheny-Fuller Div., 500 Dargan St., Pittsburgh 24, Pa.
•Bradley & Gilbert Div., 640 Seventh St., Louisville 1, Ky.
•Closure Div., 1200 W. Fullerton Ave., Chicago 14, Ill.
•Flexible Packaging Div., 1 Lisbon St., Clifton, N. J.
•Fonda Container Co., Inc., Div., St. Albans, Vt.
•General Felt Products Div., 68–35th St., Brooklyn 32, N. Y.
•Johnston Foil Mfg. Div., 6106 S. Broadway, St. Louis 11, Mo.
•Missisquoi Specialty Board Div., Sheldon Springs, Vt.
•Modern Packages Div., 4500 E. Dunham St., Los Angeles, Calif.
•National Metallizing Div., 825 New York Ave., Trenton, N. J.
•Normandie Cup Div., 119-133 E. Reed Ave., Alexandria, Va.
•Quality Park Box Co., 2520 Como Ave., St. Paul, Minn.
•Royal Lace Div., Box 210, Baer Field, Fort Wayne, Ind.
•Shelly Div., 121 Elm St., Farmington, Minn.
Standard Paper Box Corp., 3837 Broadway Place, Los Angeles 37, Calif.
Standard Paper Box Machine Co., Inc., 476 Broome St., New York 13, N. Y.
Standard Paste & Glue Co., Inc., 3620 W. 38th St., Chicago 32, Ill.
Standard Plastics, Inc., Fogelsville, Pa.
Standard Process Corp., 2704 W. Roscoe St., Chicago 18, Ill.
Standard Tool Co., 203 Hamilton St., Leominster, Mass.
Stanford Engineering Co., Box 369, Salem, Ill.
Stanley Chemical Co., Sub. The Stanley Works, Berlin St., East Berlin, Conn.
Stanley Impressions, Inc., 350 W. Fourth St., New York, N. Y.
Stanley Steel Strapping, Div. The Stanley Works, 1300 Corbin Ave., New Britain, Conn.
Stanton Paper Box Co., Inc., 218 Liberty St., Oneida, N. Y.
Staple & Stapling Machine Mfrs. Assn., 630 Third Ave., New York 17, N. Y.
Staplex Co., The, 777 Fifth Ave., Brooklyn 32, N. Y.
Star Aluminium Co., Ltd., 97 Penn Road, Wolverhampton, England
Star Case Co., The, 76 Madison Ave., New York 16, N. Y.
Star Plastic Specialties, Inc., 215 A St., Boston 10, Mass.
Star Stoneware Co., Crooksville, Ohio
Star Woolen Co., Cohoes, N. Y.
State Paper Box Co., P. O. Box 1424, Columbus, Ga.
•Statikil, Inc., 1220 W. Sixth St., Cleveland 13, Ohio
Stavis, Inc., 419 Park Ave. S., New York 16, N. Y.
Sta-Vis Oil Co., 220 Eagle St., St. Paul 2, Minn.
Sta-Warm Electric Co., 312 N. Chestnut St., Ravenna, Ohio
Stearns & Foster Co., The, Wyoming & William Sts., Cincinnati 15, Ohio
Stecher-Traung Lithograph Corp., 274 N. Goodman St., Rochester 7, N. Y.
Steck Co., The, 205 W. Ninth St., Austin 61, Texas
Stecker Paper Box Co., 9321 Michigan Ave., Detroit 10, Mich.
Steel Cooperage Div., The Serrick Corp., 4801 Bellevue Ave., Detroit 7, Mich.
Steel Parts Mfg. Co., Div. Blackstone Mfg. Co., 4630 W. Harrison St., Chicago 44, Ill.
Steel Shipping Container Institute, Inc., 600 Fifth Ave., New York 20, N. Y.
Steigerwald, A. M., Co., 1440 W. Wrightwood Ave., Chicago, Ill.
Stein Equipment Co., 107-115 Eighth St., Brooklyn 15, N. Y.
Stein, Hall & Co., Inc., 285 Madison Ave., New York 17, N. Y.
Stein, Lawrence M., Co., Inc., 815-825 W. Van Buren St., Chicago 7, Ill.
Steiner, Edgar, & Co., Inc., 45 Rockefeller Plaza, New York 20, N. Y.
Steinweiss, Inc., 1175 York Ave., New York 21, N. Y.
•Sten-C-Labl, Inc., 1821 University Ave., St. Paul 4, Minn.
Stephens-Adamson Mfg. Co., Ridgeway Ave., Aurora, Ill.
Stereotype Equipment Co., 2062 Elston Ave., Chicago 14, Ill.
Sterling Extruder Corp., 1537 W. Elizabeth Ave., Linden, N. J.
Sterling Fleischman Co., 2218 Mary Lane, Broomall, Pa.
Sterling, Inc., 5200 W. Clinton Ave., Milwaukee 23, Wis.
Sterling Lumber & Supply Co., 11900 S. Halsted St., Chicago 28, Ill.
Sterling Molders, Inc., 277 Military Road, Buffalo 22, N. Y.
•Sterling Seal Co., 316 W. 16th St., Erie, Pa.
Stern, H. C., Ltd., 121 Kingsway, London, W.C. 2, England
Sternberger, Milton, Co., The, 455 Wagner Place, Memphis 2, Tenn.
Steuer, Norman, Associates, 68 Post Road, San Francisco 4, Calif.
Steven Enterprises, 10 Broadway, Unit 4, Millbrae, Calif.
Steven, William, Co., 2520 San Fernando Road, Los Angeles 65, Calif.
Stevens, C. E., Bros., Inc., 12 W. Barre St., Baltimore 1, Md.
Stevens-Chase Design Associates, Split Rock Rd., Camillus, N. Y.
Stevens-Nelson Paper Corp., 109 E. 31st St., New York 16, N. Y.
Stevens-Wiley Mfg. Co., Inc., The, 1601 W. Glenwood Ave., Philadelphia 34, Pa.
Stewart, H. R., Enterprises, 922 Montgomery Ave., Bryn Mawr, Pa.
Stiles Conveyors & Transmissions, Inc., 596 N.W. 54th St., Miami 37, Fla.
•Stoffel Seals Corp., 68 Main St., Tuckahoe 7, N. Y.
Stoker, H. L., Co., 111 S. College Ave., Claremont, Calif.
Stokes Equipment Co., 11 West Mt. Airy Ave., Philadelphia 19, Pa.
Stokes, F. J., Corp., 5500 Tabor Road, Philadelphia 20, Pa.
Stokes Molded Products, Inc., Taylor & Webster Sts., Trenton 4, N. J.
•Stokes & Smith Plant, FMC Corp., 4942 Summerdale Ave., Philadelphia 24, Pa.
Stone Container Corp., 360 N. Michigan Ave., Chicago 1, Ill.
•Stone, Orie, Associates, Carlann Lane, Valley Cottage, N. Y.
Stone Paper Tube Co., 900 Franklin St., N.E., Washington 17, D. C.
Stone, Thomas & George M., Inc., 1415 Chestnut Ave., Hillside, N. J.
Stoner-Mudge Co., Div. American-Marietta Co., 2000 Westhall St., Pittsburgh 33, Pa.
Stonington Paper Tube Co., Inc., Gatehouse Road, Holyoke, Mass.

Storz, Albert, 1507 Three Penn Center Plaza, Philadelphia 2, Pa.
Stranahan Foil Co., Inc., 100 Wesley St., So. Hackensack, N. J.
Strange, John, Carton Co., P.O. Box 420, Menasha, Wis.
Strange, John, Paper Co., Washington St., Menasha, Wis.
Strauss, H. B., Corp., 891 Longfellow Ave., New York 59, N. Y.
Strawberry Hill Press, Inc., 23-02–49th Ave., Long Island City 1, N. Y.
Streator Dependable Mfg. Co., 410 West Broadway, Streator, Ill.
Streeter-Amet, Grayslake, Ill.
Strobel Products Co., Inc., 3015-21 W. Main St., Louisville 12, Ky.
Strobridge Lithographing Co., Norwood Station, Cincinnati 12, Ohio
Strong Cobb Arner, Inc., 2917 E. 79th St., Cleveland 4, Ohio
Strong Cobb Arner of Canada, Ltd., Fort Erie, Ont., Canada
Strong-Robinette Bag Co., Inc., 1709 Southside Ave., Bristol, Tenn.
Strouse, Adler Co., The, 78 Olive St., New Haven 7, Conn.
Struthers, John, & Co., Ltd., 5581 Pare St., Montreal 16, Que., Canada
Stuart & Gunn, 370 Lexington Ave., New York 17, N. Y.
Stull Engraving Co., 221 Banta Ave., Garfield, N. J.
Sturgis Cartons, Inc., 305 W. South St., Sturgis, Mich.
Stuyvesant Engineering Corp., Norwood, N. J.
Stylecraft Packaging Service, Inc., 2900 S. Griffith St., Charlotte 9, N. C.
Stylepak Box Corp., 2155 E. Seventh St., Los Angeles 23, Calif.
Successful Products, Inc., 5319 Ft. Hamilton Pkwy., Brooklyn 19, N. Y.
Sullifoam, Inc., 2300 Stratford Ave., Willow Grove, Pa.
Sulphite Paper Manufacturers Assn., Inc., 122 E. 42nd St., New York 17, N. Y.
Summit Container Co., 825 W. Evergreen St., Chicago 22, Ill.
Summon & Summon, 509 Madison Ave., New York 22, N. Y.
Sun Chemical Corp.
General Offices, 750 Third Ave., New York 17, N. Y.
Artistic Mfg. Co., Sub., 375 Fairfield Ave., Stamford, Conn.
Bensing Bros. & Deeney, Products of General Printing Ink Co., 750 Third Ave., New York 17, N. Y.
•Dyna-Foam Div., Ellenville, N. Y.
Electro Technical Products, Div., 113 E. Centre St., Nutley 10, N. J.
Facile Corp., Sub., 185 Sixth Ave., Paterson 20, N. J.
•General Printing Ink Co., Div., 750 Third Ave., New York 17, N. Y.
Rutherford Machinery Co., Div., 401 Central Ave., East Rutherford, N. J.
Sun Oil Co., Industrial Products Div., 1608 Walnut St., Philadelphia 3, Pa.
Sunbeam Plastics Corp., Evansville, Ind.
•Sundstrand-American Broach, Div. Sundstrand Corp., 415 W. Huron St., Ann Arbor, Mich.
Sun-Lac, Inc., 274 Lafayette St., Newark 5, N. J.
Sunlight Chemical Corp., 55 Pawtucket Ave., Rumford 16, R. I.
Superb Art Displays, Inc., 44 E. 21st St., New York 10, N. Y.
Superior Folding Box Co., 4170 Geraldine Ave., St. Louis 15, Mo.
Superior Machinery Corp., 125 Thames St., Bristol, R. I.
Superior Mfg. Co., 13th & Rockland Sts., Philadelphia 41, Pa.
Superior Marking Equipment Co., 1800 W. Larchmont Ave., Chicago 13, Ill.
Superior Paper Box Co., 625-9 W. Thompson St., Philadelphia 22, Pa.
Superior Paper Products Co., Sub. St. Regis Paper Co., Box 4449, Pittsburgh 5, Pa.
Superior Plastics, Inc., 410-430 N. Oakley Blvd., Chicago 12, Ill.
Superior Printing Ink Co., Inc., 295-309 Lafayette St., New York 12, N. Y.
Superior Tape Corp., 22 Romanelli Ave., So. Hackensack, N. J.
Supermart Packaging Co., Inc., 6839 Torresdale Ave., Philadelphia 35, Pa.
Supermatic Packaging Corp., 979 Lehigh Ave., Union, N. J.
Supreme Displays, Inc., 1 Main St., Brooklyn 1, N. Y.
Supreme Gem Paper & Twine Co., 555 W. 23rd St., New York 11, N. Y.
Sure Seal Corp., 6355 Howard St., Woods Cross, Utah
Sutnar-office, 307 E. 37th St., New York 16, N. Y.
Swan Machine Co., 320 Fifth Ave., New York 1, N. Y.
Swan Metal Cap Co., Inc., 108 N. Jefferson St., Chicago 6, Ill.
•Swanson, W. H., & Co., 1413 Lake Ave., Wilmette, Ill.
Swartz Mfg. Co., Inc., 215 Washington St., Dorchester 21, Mass.
Swayze Folding Box Co., Inc., The, 111 Troy St., Canton, Pa.
Sweeney Lithograph Co., Inc., Sub. Federal Paper Board Co., Inc., 69 Academy St., Belleville 9, N. J.
Sweetnam, George H., Inc., 286 Portland St., Cambridge 41, Mass.
Sweets, Martin, Co., Inc., The, 3131 W. Market St., Louisville 12, Ky.
Swibold, Duane, 95 E. Baltimore, Detroit 2, Mich.
Swift & Co., Adhesive Products Dept., 115 W. Jackson Blvd., Chicago 4, Ill.
Swift, George W., Jr., Inc., Bordentown, N. J.
•Swift, M., & Sons, Inc., 10 Love Lane, Hartford 1, Conn.
Swift Syringe Corp., 349 Lincoln St., Hingham, Mass.
Swiss Industrial Co., Neuhausen Rhine Falls, Switzerland
•Switzer Brothers, Inc., 4732 St. Clair Ave., Cleveland 3, Ohio
Synthetasine Protective Coatings, Inc., 600 Fifth Ave., New York 20, N. Y.
Synthon, Inc., 167 Second Ave., Cambridge 42, Mass.
Syntron Co., 251 Lexington Ave., Homer City, Pa.
Synvar Corp., Wilmington 99, Del.
Syracuse Ornamental Co., Inc., 581 S. Clinton St., Syracuse 2, N. Y.
Syracuse Plastics, Inc., 106 Mechanic St., Syracuse 2, N. Y.
Systemation Corp., 408 Pine St., St. Louis, Mo.

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TCF of Canada Ltd., 1015 Beaver Hall Hill, Montreal 1, Que., Canada
T. O. Plastics, Inc., 2901 E. 78th St., Minneapolis 23, Minn.
•Taber Instrument Corp., 111 Goundry St., No. Tonawanda, N. Y.
Tablet & Ticket Co., The, 1021 W. Adams St., Chicago 7, Ill.
Taft-Peirce Mfg. Co., The, 32 Mechanic Ave., Woonsocket, R. I.
Talley's Veneer & Crate Co., Adel, Ga.
Talmadge Printing Co., 23 Ferry St., New York 38, N. Y.
Talmalin Mfg. Co., 611 Broadway, New York 12, N. Y.
Tammen & Denison, Inc., 4751 N. Olcott Ave., Chicago 31, Ill.
Tanzi, Aurelio, Engineering Co., 430 Jefferson St., Brooklyn 37, N. Y.
Tape, Inc., 2612 S. Broadway, Green Bay, Wis.
Taranger, E., Inc., 1611 S.W. First Ave., Fort Lauderdale, Fla.
Tarpey, Thomas, Inc., 414 W. Main St., Louisville 2, Ky.
Tarshis, N. L., Co., 1123 Broadway, New York 10, N. Y.
Tart Cooperage Co., Box 3363, Jacksonville, Fla.
Tavor, Luba, 260 W. 72nd St., New York, N. Y.
Taylor Box Co., 293 Child St., Warren, R. I.
Taylor, Page, 106 Prospect St., Nutley 10, N. J.
Taylor-Reed Corp., The, 15 Crescent St., Glenbrook, Conn.
Taylor, Stiles & Co., 207 Bridge St., Riegelsville, N. J.
Teague, Walter Dorwin, Associates, 415 Madison Ave., New York 22, N. Y.
Tech Art Plastics Co., Inc., 111 Ridgedale Ave., Morristown, N. J.
Technical Assn. of the Pulp & Paper Industry, 360 Lexington Ave., New York 17, N. Y.
Technical Industries, Inc., 518 Barron Ave., Woodbridge, N. J.
Technical Tape Corp., 240 North Ave., New Rochelle, N. Y.
Technifoam Corp., 717 Fifth Ave., New York 22, N. Y.
Techniform, Inc., 7756 Balboa Blvd., Van Nuys, Calif.
Techniglas, Adamston, N. J.
Technopol Laboratories Ltd., 212 St. John St., London, E.C.1, England
Tecpak, S.A., Poniente 134 No. 718-12, Mexico 16, D.F., Mexico
Teddy Studios, 22 E. 17th St., New York 3, N. Y.
Teepack Spezialmaschinen G.m.b.H. & Co., Kevelaerer Str. 19/23, Duesseldorf-Heerdt, Germany
Tee-Pak, Inc., 3520 S. Morgan St., Chicago 9, Ill.
Tele-Sonic Packaging Corp., 208 W. 27th St., New York 1, N. Y.
Temple Mfg. Co., P.O. Box 567, Dallas 1, Texas
Tempo-Vane Mfg. Co., 330 First St., San Francisco 5, Calif.
Tennant, C., Sons & Co. of New York, 100 Park Ave., New York 17, N. Y.
Tennessee Paper Mills, Inc., Manufacturers Road, Chattanooga 5, Tenn.
Tenney Engineering, Inc., 1090 Springfield Road, Union, N. J.
Tension Envelope Corp., 19th & Campbell Sts., Kansas City 8, Mo.
Terkelsen Machine Co., 326 A St., Boston 10, Mass.
Terrell Corp., The, 820 Woburn St., Wilmington, Mass.
Testing Machines, Inc., 72 Jericho Turnpike, Mineola, N. Y.
Testworth Laboratories, Inc., Commercial Road at Westgate, Addison, Ill.
Tetra Pak Co., Inc., 939 Rahway Ave., Union, N. J.
Texas Plastics, Inc., P.O. Box 278, Elsa, Texas
Texlon Corp., 139 Howell St., Dallas 7, Texas
Textile Bag Manufacturers Assn., 518 Davis St., Evanston, Ill.
Textile Color Card Assn. of U. S., Inc., 200 Madison Ave., New York, N. Y.
•Textile Machine Works, Packomatic Div., Reading, Pa.
Textileather Div., The General Tire & Rubber Co., 607 Madison Ave., Toledo 3, Ohio
Thatcher Glass Mfg. Co., Inc., 375 Park Ave., New York 22, N. Y.
Thatcher Glass Mfg. Co., Inc., Plastic Container Div., 375 Park Ave., New York 22, N. Y.

Thayer, Henry, Co., 100 Inman St., Cambridge 39, Mass.
Thayer Mfg. Co., Main St., Maynard, Mass.
Thayer Scale Corp., 1 Thayer Park, Pembroke, Mass.
Thermatron Co., The, Div. Willcox & Gibbs, 214 W. 39th St., New York 18, N. Y.
Thermel, Inc., 9400 W. Robinson Road, Franklin Park, Ill.
•Thermo Heat Sealing Machine Co., Inc., 692 Broadway, New York 12, N. Y.
Thermomat Co., Inc., 623 Prospect St., Trenton 8, N. J.
Thermoplastic Processes, Inc., Valley Road, Stirling, N. J.
Thermo-Plastic Products Co., Inc., 1645 Old County Rd., San Carlos, Calif.
Thiele Packaging Machinery Co., Div. Stainless & Steel Products Co., 1000 Berry Ave., St. Paul 14, Minn.
•Thilmany Pulp & Paper Co., Stribley Rd., Kaukauna, Wis.
Thimonnier & Cie., 79 Rue de Bourgogne, Lyon, France
Thomas Engineering Co., Inc., 9257 N. Laramie Ave., Skokie, Ill.
Thomas Plastikraft Corp., Campion Rd., New Hartford, N. Y.
Thomas, R. P., Co., Inc., 316 Westbury Ave., Carle Place, N. Y.
Thomas Stationery Mfg. Co., 1713 Sheridan Ave., Springfield, Ohio
Thomas Truck & Caster Co., 18 S. Seventh St., Keokuk, Iowa
Thompson Can Co., 13401 Denton Drive, Dallas 34, Texas
Thompson, Elmo, 4027 Faxon Ave., Memphis 17, Tenn.
Thompson, James, & Co., Inc., 112-114 Prince St., New York 12, N. Y.
Thomson-Leeds Co., Inc., 250 E. 51st St., New York 22, N. Y.
Thomson-National Press Co., Inc., Dean Ave., Franklin, Mass.
Thormac Packaging Corp., 2141 N. Lincoln Ave., Chicago 14, Ill.
Thornton, F. C., Co., The, 6116 Park Ave., Cleveland 5, Ohio
Thornton Mfg. Co., 745 Pacific Ave., Salt Lake City 4, Utah
Thorpe, F. M., Mfg. Co., P.O. Box 310, Lamar, Mo.
Thrissel Engineering Co., Ltd., The, Easton Road, Bristol 5, England
Thurman Scale Co., 1939 Refugee Ave., Columbus, Ohio
Thwing-Albert Instrument Co., Penn St. & Pulaski Ave., Philadelphia 44, Pa.
Tickner, E. C., 57 Union Place, Summit, N. J.
Tier-Rack Corp., 122 N. Seventh St., St. Louis 1, Mo.
Tier-Rack Southern Corp., Ellijay, Ga.
Tiffin Art Metal Co., Sub. Springfield Greene Industries, Inc., Springfield, Ohio
Tillery Container Co., 6000 Wilson Ave., Kansas City 23, Mo.
Timely Packaging Associates, 369 Lexington Ave., New York 17, N. Y.
Time-Saving Specialties, 2922 Bryant Ave. S., Minneapolis 20, Minn.
Tinnerman Products, Inc., P.O. Box 6688, Cleveland 1, Ohio
Tipper Tie Products of New Jersey, Inc., 407-11 Chestnut St., Union, N. J.
Tobin-Howe Paper Box Co., 211 Mt. Prospect Ave., Clifton, N. J.
Todt, Fred, Co., 2021 S. Hill St., Los Angeles 7, Calif.
Toensmeier, Patrick A., & Associates, 2802 Whitney Ave., Hamden 18, Conn.
Toilet Goods Assn., Inc., 1270 Sixth Ave., New York, N. Y.
Toledo Paper Box Co., The, 1112 True St., Toledo 7, Ohio
Toledo Scale, Div. Toledo Scale Corp., 1025 Telegraph Road, Toledo 12, Ohio
•Tol-O-Matic, Inc., 246 Tenth Ave., S., Minneapolis 15, Minn.
Tomah Products, Inc., 501 William St., Tomah, Wis.
•Tompkins' Label Service, Frankford Ave. at Allegheny Ave., Philadelphia 34, Pa.
Topflight Corp., 160 E. Ninth Ave., York, Pa.
Topper Mfg. Corp., 2410 W. Carson St., Torrance, Calif.
Toronto Type Foundry Co., Ltd., 120 Wellington St., W., Toronto, Ont., Canada
Torsion Balance Co., The, 35 Monhegan St., Clifton, N. J.
Towanda Folding Box Co., P.O. Box 127, Towanda, Pa.
Tower Envelope Co., 1263 Virginia Ave., New York 72, N. Y.
Tower Packaging Co., 1150 S. Willis Ave., Wheeling, Ill.
Townson, W. D., Lumber Co., Ranger Road, Murphy, N. C.
Tracerlab, Inc., 1601 Trapelo Road, Waltham 54, Mass
Tragacine Adhesives, Kirkstall Road, Leeds 3, England
Trans Flex Packagers, Inc., 40 Burnham Ave., Unionville, Conn.
Transilwrap Co., 4427 N. Clark St., Chicago 40, Ill.
Trans-Packers, Inc., 122 Washington Ave., Brooklyn 5, N. Y.
Transpak, Inc., 4000 E. Tenth Court, Hialeah, Fla.
Transparent Bag Co., 901 Twelfth Ave., Seattle 22, Wash.
Transparent Fabricators, Inc., 220 Fifth Ave., New York, N. Y.
Transparent Paper Ltd., Halifax House, 51-5 Strand, London, W.C.2, England
Transparent Products Co., Inc., 324 E. 24th St., New York 10, N. Y.
Transparent Specialties Corp., 3828 E. 91st St., Cleveland 5, Ohio
Transparent Tube Co., 4431 W. Diversey Ave., Chicago, Ill.
Trapow, D., & Co., Ltd., 113 Regents Park Road, London, N.W.1, England
Trautmann, Bailey & Blampey, 13 Laight St., New York 13, N. Y.
Traver Investments, Inc., 1092 Bluff Road, Glencoe, Ill.
Treen Box Co., Tioga & Memphis Sts., Philadelphia 34, Pa.
Trefolex, Inc., 151 Sherman Ave., New York 34, N. Y.
Trenton Folding Box Co., 106 Ewing St., Trenton 5, N. J.
•Trescott Co., Inc., The, 62 N. Main St., Fairport, N. Y.
Tri Pak Machinery Service, Inc., P.O. Box 1228, Harlingen, Texas
Triangle Bag Co., 1201-1399 Madison Ave., Covington, Ky.
Triangle Container Corp., 1501 W. 15th St., Chicago 8, Ill.
Triangle Ink & Color Co., Inc., 33 Mill St., Bernardsville, N. J.
•Triangle Package Machinery Co., 6655 W. Diversey Ave., Chicago 35, Ill.
Triangle Paper Bag Mfg. Co., The, 1301 Madison Ave., Covington, Ky.
Tri-Boro Carton Co., Inc., 85 Classon Ave., Brooklyn 5, N. Y.
Trilsch, Oscar, Co., 150-25–18th Ave., Whitestone 57, N. Y.
Trinity Bag & Paper Co., Inc., 25 W. 43rd St., New York 36, N. Y.
Trio Metal Cap Co., 317 N. Francisco Ave., Chicago 12, Ill.
Triple-X Chemical Laboratories, Inc., 2803 S. Calumet Ave., Chicago 16, Ill.
Tripp Tape, Inc., 8120 Ridgeway Ave., Skokie, Ill.
•Tri-State Plastic Molding Co., Inc., 505 Fourth St., Henderson, Ky.
Tri-Wall Containers, Inc., 799 Washington St., New York 14, N. Y.
Trombley, Pisani & Trombly Design Corp., 1100 N. Woodward, Birmingham, Mich.
•Tronomatic Corp., 25 Bruckner Blvd., Bronx 54, N. Y.
Trowbridge Conveyor Co., 851 Van Houten Ave., Clifton, N. J.
Trum, E. J., Inc., 80 Richards St., Brooklyn 31, N. Y.
Tube Manifold Corp., 415 Bryant St., No. Tonawanda, N. Y.
Tubed Chemicals Corp., 186 Pleasant St., Easthampton, Mass.
Tubophane S.A., 108, rue de Flandre, Paris 19e, France
Tupper Co., Branch River Lab., Rte. 146, Woonsocket, R. I.
TuRex Plastics, Div. Rexall Drug & Chemical Co., Woonsocket, R. I.
Turner Tube Corp., 220 Raritan Ave., Highland Park, N. J.
Tuttle Press Co., The, 802 N. Union St., Appleton, Wis.
Twentieth Century Plastics, Inc., 415 E. Washington Blvd., Los Angeles 15, Calif.
Twinpak Limited, 270 St. Joseph Blvd., Lachine, Que., Canada
Twitchell, E. W., Inc., Packaging Div., 2801 N. Third St., Philadelphia 33, Pa.
Twombly, C. E., Co., 146 Mystic Ave., Medford 55, Mass.
Tymatics, Inc., 2720 Sylvan Ave., Dallas 12, Texas
Type & Press of Illinois, Rotary Press Div., 3312 N. Ravenswood Ave., Chicago 13, Ill.

U

U B S Chemical Corp., 491 Main St., Cambridge 46, Mass.
Ullman, Martin, 113 W. 57th St., New York, N. Y.
Ullmann, R. P., Co., 2461 W. Warren St., Detroit 8, Mich.
•Ultra Sonic Seal, Inc., Div. Kleer-Vu Industries, Inc., 76 Madison Ave., New York 16, N. Y.
Unette Corp., 26 Okner Parkway, Livingston, N. J.
Unger Co., The, 1273 W. Ninth St., Cleveland 13, Ohio
Unger Laminating Co., Inc., 51 Bergen St., Brooklyn 1, N. Y.
Uni Pak Corp., 1330 S. Gerhart Ave., Los Angeles 22, Calif.
Uni-Mark, Inc., 169 A St., Boston 10, Mass.
Union Bag-Camp Paper Corp.
General Offices, 233 Broadway, New York 7, N. Y.
Miller & Miller, Inc., Sub., P.O. Box 865, Atlanta, Ga.
Union Carbide Corp.
General Offices, 270 Park Ave., New York 17, N. Y.
Linde Co., Div., 270 Park Ave., New York 17, N. Y.
Silicones Div., 270 Park Ave., New York 17, N. Y.
Union Carbide Chemicals Co., Div., 270 Park Ave., New York 17, N. Y.
Union Carbide International Co., Plastics Dept., Div., 270 Park Ave., New York 17, N. Y.
•Union Carbide Plastics Co., Div., 270 Park Ave., New York 17, N. Y.
Visking Co., Plastic Films, Div., 6733 W. 65th St., Chicago 38, Ill.
•Union Paste Co., 1605 Hyde Park Ave., Boston 36, Mass.
Union Printing Ink Co., The, 1033 S. High St., Akron 11, Ohio

Union Special Machine Co., 400 N. Franklin St., Chicago 10, Ill.
Union Specialty Co., Inc., 57 Main St., Bloomingdale, N. J.
•Union Standard Equipment Co., 318-322 Lafayette St., New York 12, N. Y.
Union Steel Products Co., 500 N. Berrien St., Albion, Mich.
Union Tool Corp., The, 800 N. Detroit St., Warsaw, Ind.
Union Transbag Co., 303 Canal St., Providence 3, R. I.
Union Wadding Co., 125 Goff Ave., Pawtucket, R. I.
Unipack Corp., 5917 N. Northwest Hwy., Chicago 31, Ill.
Unique Printed Products Co., Inc., 2222 N. 13th St., Terre Haute, Ind.
Unit Portions, Inc., 176 Cherry Valley Road, West Hempstead, N. Y.
United Board & Carton Corp., 2 Park Ave., New York 16, N. Y.
United Carton Co., 727 N. Kedzie Ave., Chicago 12, Ill.
United Container Co., 56th & Lancaster Ave., Philadelphia 31, Pa.
United Elastic Corp., 1 Payson Ave., Easthampton, Mass.
United Lacquer Mfg. Corp., 1001 W. Elizabeth Ave., Linden, N. J.
United Mineral & Chemical Corp., 16 Hudson St., New York 13, N. Y.
United Packaging Co., Inc., 4511 Wayne Ave., Philadelphia 44, Pa.
United Paper Box Co., 406 Bryant St., San Francisco 7, Calif.
United Paper Box Co., Inc., Water St., Holyoke, Mass.
United Paper Box Corp., 727 N. Kedzie Ave., Chicago 12, Ill.
United Paste & Glue Corp., 40 Renwick St., New York 13, N. Y.
United Progress, Inc., 54-60 Dott Ave., Albany 5, N. Y.
•United Shoe Machinery Corp., 140 Federal St., Boston 7, Mass.
•U. S. Automatic Box Machinery Co., Inc., 18 Arboretum Road, Roslindale, Boston 31, Mass.
U. S. Bottlers Machinery Co., 4015 N. Rockwell St., Chicago 18, Ill.
United States Box Co., 67 Metropolitan Ave., Brooklyn 11, N. Y.
U. S. Cap & Closure, Inc., 77 W. Washington St., Chicago 2, Ill.
U. S. Corrugated Fibre Box Co., 2900 N. Franklin Rd., Indianapolis 19, Ind.
U. S. Electrical Motors, Inc., 200 E. Slauson Ave., Los Angeles 54, Calif.
U. S. Engineering Co., 40-24—22nd St., Long Island City 1, N. Y.
•United States Envelope Co., 21 Cypress St., Springfield 2, Mass.
U. S. Fibre & Plastics Corp., Union St., Stirling, N. J.
U. S. Filter Corp., P. O. Box 4017, Richmond 24, Va.
U. S. Finishing & Mfg. Co., 775 W. Jackson Blvd., Chicago 6, Ill.
United States Gasket Co., 600 N. Tenth St., Camden 1, N. J.
U. S. Hoffman Can Corp., 50th St. & First Ave., Brooklyn, N. Y.
•U. S. Industrial Chemicals Co., Div. National Distillers & Chemical Corp., 99 Park Ave., New York 16, N. Y.
United States Metered Container Corp., 527 Madison Ave., New York 22, N. Y.
United States Packaging Co., 69 E. 75th St., Chicago 19, Ill.
United States Packaging Corp., 55 California Ave., Paterson 3, N. J.
U. S. Plastic Molding Corp., Carlton St., Wallingford, Conn.
United States Plywood Corp., 55 W. 44th St., New York 36, N. Y.
United States Printing Ink Corp., Industrial Ave., Little Ferry, N. J.
•United States Printing & Lithograph, Div. Diamond National Corp., 733 Third Ave., New York 17, N. Y.
United States Radium Corp., Morristown, N. J.
United States Rubber Co., 1230 Avenue of The Americas, New York 20, N. Y.
United States Rubber Co., Naugatuck Chemical Div., Elm St., Naugatuck, Conn.
United States Steel Products Div., United States Steel Corp., 30 Rockefeller Plaza, New York 20, N. Y.
U. S. Steel Supply Div., United States Steel Corp., 208 S. LaSalle St., Chicago 40, Ill.
U. S. Tape Corp., 4168 Manchester Ave., St. Louis 10, Mo.
United States Testing Co., Inc., 1415 Park Ave., Hoboken, N. J.
United States Trademark Assn., The, 6 E. 45th St., New York 17, N. Y.
United Steel Barrel Co., 225 S. 15th St., Philadelphia 2, Pa.
Unitronics, Inc., 472 Paul Ave., Ferguson Station, St. Louis 21, Mo.
Unity Stamp Co., Inc., 7 W. 30th St., New York 1, N. Y.
Universal Corrugated Box Machinery Corp., 1233 W. St. George Ave., Linden, N. J.
Universal Folding Box Co., Inc., Madison & Thirteenth Sts., Hoboken, N. J.
Universal Glass Products Co., P.O. Box 551, Parkersburg, W. Va.
Universal Jewelry Case Co., 165 Front St., Chicopee, Mass.
Universal Packaging, Inc., Mill & Buchanan Sts., Plainfield, Ind.
Universal Unlimited, Inc., Pratt Oval, Glen Cove, N. Y.
Univial Corp., The, 16 Glen Road, Rutherford, N. J.
Upressit Metal Cap Corp., Sugar Hollow Road, Danbury, Conn.
Upson Co., The, Stevens St., Lockport, N. Y.
Utica Box Co., Inc., 2150 Erie St., Utica 4, N. Y.
Utility Crate Co., 2019 Imperial St., Los Angeles 21, Calif.
Utility Printing Co., 484 Washington Ave., Carlstadt, N. J.
Utleys, 72-26 Loubet St., Forest Hills 75, N. Y.

V

VCA, Inc., 1720 Fairfield Ave., Bridgeport 5, Conn.
VIE Design Studios, 895 Dayton St., Yellow Springs, Ohio
Vac-Pac Corp., 150 W. Ostend St., Baltimore 30, Md.
Vac-Tie Fasteners, Inc., 1140 E. Jersey St., Elizabeth 4, N. J.
Vaculite Corp., 70 Memorial Drive, Cambridge, Mass.
Vacuum Metalizing Corp., 32-36 Greenpoint Ave., Long Island City 1, N. Y.
Vacuum Molding, Inc., 123 Myrtle Ave., Boonton, N. J.
Vacuum Plastics Corp., 1096 Scott St., Columbus 22, Ohio
Valley Coating & Packaging Co., 1531 Washington Ave., St. Louis 3, Mo.
Valley Craft Products, Inc., 750 Jefferson St., Lake City, Minn.
Valley Iron Works Co., E. South Island St., Appleton, Wis.
Valley-National Corp., The, Clark St., Milldale, Conn.
Valley Plastics, Inc., 58 Main St., Thompsonville, Conn.
Valley Printing Ink Corp., 2220 Willow St., Green Bay, Wis.
Valpey Press, 65 Clinton St., Malden 76, Mass.
Van Buren Machine Corp., 750 Grand St., Brooklyn 11, N. Y.
Van Buskirk & Co., Inc., 39 Hubbell St., Bridgeport 5, Conn.
Van Dorn Iron Works Co., The, 2685 E. 79th St., Cleveland 4, Ohio
Van Dyck Associates, Inc., 1 Bridge Sq., Westport, Conn.
Van Leer, B., N.V., Stadhouderskade 6, Amsterdam-W., Holland
Van Leer's Vatenfabrieken, N.V., Stadhouderskade 6, Amsterdam-W., Holland
Van Ness Bros., Inc., 104 Gray St., Paterson 3, N. J.
Van Norman Molding Co., 4635 Cottage Grove Ave., Chicago 15, Ill.
Van Pell Chemical & Supply Corp., 48 E. First St., New York 3, N. Y.
Van Rosen, R. E., 205 E. 69th St., New York, N. Y.
Van Vick Paper Box Co., 4904 Oneota St., Duluth 7, Minn.
Van Waardt, Wm., Co., Inc., 112 Charlton St., New York, N. Y.
Vanant Co., Inc., 5848 N. 96th St., Milwaukee 18, Wis.
Vanetta Mills, Inc., 1441 Broadway, New York 18, N. Y.
Vanguard Plastics, Inc., 29 Bannard St., Freehold, N. J.
Vanity Fair Paper Mills, Inc., Margaret St., Plattsburgh, N. Y.
VanPak Products, Inc., 501 William St., Tomah, Wis.
Varigraph Co., Inc., 841 W. Lakeside St., Madison 1, Wis.
Varn Products Co., Inc., 26-15—123rd St., Flushing 54, N. Y.
Vassos, John, 54 W. 55th St., New York 19, N. Y.
Ve-Alite Plastic Corp., 2700 Nostrand Ave., Brooklyn 10, N. Y.
Veeder-Root, Inc., 70 Sargeant St., Hartford 2, Conn.
Velvetone Co., 108 Davis St., San Francisco 11, Calif.
Velvetone Finishing Corp., 10-40—46th Ave., Long Island City 1, N. Y.
Venesta Foils Ltd., Thorn House, Upper St. Martin's Lane, London, W.C. 2, England
Veritone Co., The, 2020 Ruby St., Melrose Park, Ill.
VERMA, N.V. Emballagefabrieken v/h, Keulsekade 216, Utrecht, Holland
Verner, B., & Co., Inc., 52 Duane St., New York 7, N. Y.
Vernon Chemical & Mfg. Corp., 220 E. 42nd St., New York 17, N. Y.
Versapak Film & Packaging Machinery Corp., 928 Broadway, New York 10, N. Y.
Verson Allsteel Press Co., 9344 S. Kenwood, Chicago 19, Ill.
Vertex Co., 120 Millroad, Montvale, N. J.
Vertipile, Inc., 650 Lawrence St., Lowell, Mass.
•Vertrod Corp., 2037 Utica Ave., Brooklyn 34, N. Y.
Vibro-Plus Products, Inc., Stanhope, N. J.
Vickers-Armstrongs (Engineers) Ltd., 13 City Road, London, E.C.1, England
Vickers, Charles D., & Co., Box 325, La Grange, Ill.
Vickery Tape & Machine Co., Inc., 286 W. Third St., Peru, Ind.
Victor Industries Corp. of Calif., 365 E. 20th St., Chico, Calif.
Victor Metal Products Corp., Highway 67 N., Newport, Ark.
Viking Engraving Corp., The, 1432 N. Grant Ave., Columbus 1, Ohio
Vinyl-Weld Products Co., Inc., 220 W. Ontario St., Chicago 10, Ill.
Virginia Barrel Div., The Greif Bros. Cooperage Corp., 178 Holland Ave., Staten Island 3, N. Y.

Virginia-Carolina Chemical Corp., Bag Div., 401 E. Main St., Richmond, Va.
Virginia Chemical Corp., 1920 Rose Lane, Lynchburg, Va.
Virginia Folding Box Co., Inc., Sub. West Virginia Pulp & Paper Co., 320 Hull St., Richmond 24, Va.
Virginia Laminating Co., Amelia, Va.
Virkotype Corp., 111 Rock Ave., Plainfield, N. J.
Vis-A-Pak Mfg. Corp., 621 E. 216th St., New York 67, N. Y.
Visible Package Sales Corp., 540 N. Lake Shore Drive, Chicago 11, Ill.
Vision Art Studios, 128 Broadway, Paterson 1, N. J.
Visking Co., Plastic Films, Div. Union Carbide Corp., 6733 W. 65th St., Chicago 38, Ill.
Visual Bag, Inc., 10 Van Cortlandt Ave. E., New York 68, N. Y.
Visual Marketing, Inc., 375 Park Ave., New York 22, N. Y.
Visual Packaging Co., Inc., 249 E. 88th St., Brooklyn 36, N. Y.
Vitale, Lee, Associates, 109 E. 36th St., New York 16, N. Y.
Vitarine Co., Inc., The, 625 W. 55th St., New York 19, N. Y.
Vitex Plastics, Inc., 830 Broadway, New York 3, N. Y.
Vitratone Engraving Corp., 345 Bergen St., Brooklyn 17, N. Y.
Vizofilm Mfg. Corp., 344 Coster St., New York, N. Y.
Vizuall Co., Inc., The, 34 E. Tenth St., New York 3, N. Y.
•Vlchek Tool Co., The, 3001 E. 87th St., Cleveland 4, Ohio
Voges Mfg. Co., Inc., 103-11—98th St., Ozone Park 17, N. Y.
Vol-Pak, Inc., 25 Broadway, New York 4, N. Y.
Volpe, Lili, 2312 Hynes Place, Bellmore, N. Y.
Von der Lancken, J., & Assoc., 47 E. 44th St., New York 21, N. Y.
Von Miklos, Josephine, Pound Ridge, N. Y.
Vorac Co., The, 147 Meadow Road, Rutherford, N. J.
Voss, Karl, Corp., 1100 Adams St., Hoboken, N. J.
Vulcan Containers (Canada) Ltd., 15 Bethridge Rd., Rexdale, Ont., Canada
•Vulcan Electric Co., 88 Holten St., Danvers, Mass.
Vulcan Steel Container Co., 3055—35th Ave. N., Birmingham 2, Ala.

W

W.E.W. Container Co., 173 Lott Ave., Brooklyn 12, N. Y.
W & F Manufacturing Co., Inc., 251-257 Seneca St., Buffalo 5, N. Y.
Wabash Fibre Box Co., Div. The Weston Paper & Mfg. Co., 2000 N. 19th St., Terre Haute, Ind.
Wachusett Converters, Inc., 124 Water St., Leominster, Mass.
Wackerbarth Box Shop, Granby Road, Granville, Mass.
Wadley Veneer & Box Co., Wadley, Ga.
Wagner, Edward A., & Associates, 3911 Oak Lawn, Dallas 19, Texas
Wagner Folding Box Corp., 1534 Bailey Ave., Buffalo 12, N. Y.
Wagner Iron Works, 1906 S. First St., Milwaukee 1, Wis.
Wagner, Victor, & Son, Inc., 115 Ash St., Buffalo 4, N. Y.
Wainess, Harold, & Associates, 510 N. Dearborn St., Chicago 10, Ill.
Waldorf Paper Products Co., 2250 Wabash Ave., St. Paul 14, Minn.
•Waldron-Hartig Div., Midland-Ross Corp., P.O. Box 791, New Brunswick, N. J.
Walgan Machine Corp., 120 E. 13th St., New York 3, N. Y.
Walker Bag Co., Inc., 122 N. Tenth St., Louisville 2, Ky.
Wall, C. M., & Son, Inc., P.O. Box 583, Lexington, N. C.
Wallace Co., The, 41 California St., Bridgeport 8, Conn.
Wallace Paper Box Corp., 52-07 Flushing Ave., Maspeth 78, N. Y.
Walle & Co., Inc., 401 Tchoupitoulas St., New Orleans 12, La.
Walsello Products, Inc., 132 Beckwith Ave., Paterson 3, N. J.
Walton Laboratories, Inc., 1186 Grove St., Irvington 11, N. J.
Ward & Douglass, 56 Center St., Chatham, N. J.
Warder Paper Box Co., Inc., 832 Ashland Ave., Niagara Falls, N. Y.
Warneke Paper Box Co., 1617 Wazee St., Denver 2, Colo.
•Warner Brothers Co./Packaging, The, 325 Lafayette St., Bridgeport 1, Conn.
Warner Electric Brake & Clutch Co., Beloit, Wis.
Warren Metal Decorating Plant, National Can Corp., Griswold St. Ext., Warren, Ohio
Warren-Nicholson Co., 1730 Rockingham Road, Davenport, Iowa
•Warren, S. D., Co., 89 Broad St., Boston 1, Mass.
Warren Wire Co., Pownal, Vt.
Warwick Wax Div., The Western Petrochemical Corp., 2 W. 45th St., New York 36, N. Y.
Washington Steel Products, Inc., 1940 E. Eleventh St., Tacoma 2, Wash.
Waterbury Companies, Inc., 835 S. Main St., Waterbury 20, Conn.
Waterproof Paper Mfrs. Assn., Inc., The, 122 E. 42nd St., New York 17, N. Y.
Watertown Mfg. Co., The, 1000 Echo Lake Road, Watertown, Conn.
Watlow Electric Mfg. Co., 1376 Ferguson Ave., St. Louis 33, Mo.
Watson-Standard Co., 225 Galveston Ave., Pittsburgh 30, Pa.
Watson-Stillman Press Div., Farrel-Birmingham Co., Inc., 565 Blossom Road, Rochester 10, N. Y.
Waxed Paper Institute, Inc., 38 S. Dearborn St., Chicago 3, Ill.
Waxed Paper Merchandising Council, 38 S. Dearborn St., Chicago 3, Ill.
Wayne Paper Box & Printing Corp., 102 W. Superior St., Fort Wayne 7, Ind.
Weatherproof Fibre Box Group, 1145—19th St., N.W., Washington 6, D. C.
Weaver Packaging Co., 3700 Clifton Place, Montrose, Calif.
•Web Controls Corp., 318 Briarcliffe Road, West Englewood, N. J.
Webb, Jervis B., Co., 8951 Alpine Ave., Detroit 4, Mich.
Webcon Div., Weber Aircraft Corp., 2820 Ontario St., Burbank, Calif.
Weber, David, Co., 3500 Richmond St., Philadelphia 34, Pa.
Weber, H. G., & Co., Inc., 725 Fremont St., Kiel, Wis.
Weber Marking Systems, Inc., 215 E. Prospect Ave., Mount Prospect, Ill.
•Weber Plastics, Inc., 133 W. Ellis St., Stevens Point, Wis.
Webster, Benjamin L., Glasco Turnpike, Woodstock, N. Y.
Webster Equipment Co., Inc., 549 W. Randolph St., Chicago 6, Ill.
Webster Industries, Inc., 45 Congress St., Salem, Mass.
Webster Mfg., Inc., Hall St., Tiffin, Ohio
Wedgewood Press, Inc., 216 W. 18th St., New York 11, N. Y.
Weigh Right Automatic Scale Co., Mills Road, Joliet, Ill.
Weil & Newman, Inc., 6020 Ft. Hamilton Pkwy., Brooklyn 19, N. Y.
Weil's, David, Sons Lithographic Co., 315 Berry St., Brooklyn 11, N. Y.
Weinman Brothers, Inc., 3260 W. Grand Ave., Chicago 51, Ill.
Weirton Steel Co., Weirton, W. Va.
Welded Plastics Corp., 1907 Park Ave., New York 35, N. Y.
Welding Engineers, Inc., P.O. Box 391, Norristown, Pa.
Weldon Industries, Inc., Hoosick Falls, N. Y.
•Weldotron Corp., 841 Frelinghuysen Ave., Newark 12, N. J.
Wellington Associates, Phoenixville, Pa.
Wells Badger Corp., 225 W. Capitol Dr., Milwaukee 12, Wis.
Wells Commercial Sales Co., Harbor Way & Littlefield Rd., So. San Francisco, Calif.
Wells, George E., Inc., 4375 Duncan Ave., St. Louis 10, Mo.
Wendig Associates, 29 Brookside Dr., Feasterville, Pa.
Werner Mfg. Co., 44th St. & First Ave., Lyons, Ill.
Werthan Bag Corp., 1400 Eighth Ave. N., Nashville 1, Tenn.
Wertsville Industries, Inc., 213 E. 55th St., New York 22, N. Y.
Wespak, Inc., 475 Alfred Ave., Teaneck, N. J.
Wessel, Stanley, & Co., 420 N. Michigan Ave., Chicago 11, Ill.
West Bend Equipment Corp., P.O. Box 2471, West Bend, Wis.
West Carrollton Parchment Co., P.O. Box 98, West Carrollton 49, Ohio
West Coast Plastics Distributors, Inc., 9014 Lindblade St., Culver City, Calif.
West Co., Inc., The, West Bridge St., Phoenixville, Pa.
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